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CHAPEL HILL, N. C., U. S. A.

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JOURNAL

OF THE

Elisha Mitchell Scientific Society

Volume 58 December, 1942 No. 2

PROCEEDINGS OF THE FORTY-FIRST ANNUAL MEETING OF THE NORTH CAROLINA ACADEMY OF SCIENCE

WOMAN'S COLLEGE, UNIVERSITY OF NORTH CAROLINA, GREENSBORO, NORTH CAROLINA

The forty-first annual meeting of the North Carolina Academy of Science was held at the Woman's College of the University of North Carolina at Greensboro, April 24 and 25, 1942.

The first general session was called to order by President R. E. Coker at 10:30 A. M. The presentation of papers began at once and continued until 1:00 P. M. The Biochemistry and Physiology section also met Friday morning, and the Psychology section conducted a panel session during the morning.

The reading of papers before the general session was resumed at 2:00 P. M. and continued until 3:45 P. M., when the Academy recessed to look over the demonstrations and exhibits and enjoy a bit of refreshment served by the College.

The Academy reconvened at 4:30 P. M. to transact such business as came before it. The business meeting was called to order by President Coker. The minutes of the 1941 meeting, as published in the Mitchell Journal, were approved. Reports of the various committees were then called for. These reports for the most part had been mimeographed and distributed to the members as they registered. Since the complete reports were available to the membership at the meeting (and may still be obtained by writing the Secretary) somewhat abbreviated reports are given here.

REPORT OF THE EXECUTIVE COMMITTEE

The following business was transacted by correspondence. The Committee appropriated $150 for secretarial aid to the Secretary. It also voted a bonus of $50 to the Journal of the Elisha Mitchell Scientific Society for 1941. The date for the annual meeting of the Academy was set, as was also the date for the annual meeting of the Executive Committee. The Committee authorized the appointment of a special committee to consider problems relating to industry and science. Eleven new members were elected by mail.

The regular annual meeting of the Committee (with all members but one present) was held in Durham, April 18.

An invitation to hold the 1943 meeting at Duke University was received from President R. L. Flowers. The invitation was accepted.

After a preliminary report by the Secretary-Treasurer the Committee authorized several irregularities in the published program. At the proper place the Committee will make certain recommendations which will obviate the difficulties encountered in arranging the current program. The Committee authorized the Treasurer to make a preliminary report at the annual meeting with the understanding that the final report be based upon the bank statement of June 1. The final report when certified by the auditors is to be published as a part of the 1942 Proceedings.

The Committee authorized the Secretary to secure by gift or purchase a complete file (if available) of the published Proceedings. These are to be bound and kept by the Secretary. Our earlier records are then to be transferred to some place of safety.

The Committee reports that the following have been elected to membership in the Academy.

Allen, Mr. C. M., Biology, Wake Forest.
Barton, Miss Eleanor P., Zoology, Duke.
Botany Club, W. C. U. N. C.
Brackett, Dr. Sterling, Public Health, U. N. C.
Brockman, Miss Marian, student in chemistry, Catawba.
Chow, Mr. Edward Haa-Sheng, pre-medical student, Wake Forest.
Coldwell, Miss E. Inez, Biology, W. C. U. N. C.
Conner, Mrs. Elizabeth Hatcher, Biology, High Point College.
Daniel, Dr. W. J., Psychology, U. N. C.
Darsie, Mr. J. C., Div. of Game and Inl. Fisheries, Salisbury.
Decker, Dr. J. P., Botany, Duke.
Edwards, Miss Flora White, Home Economics, W. C. U. N. C.
Endicott, Dr. Margaret M., Chemistry, W. C. U. N. C.
Evans, Dr. F. G., Zoology, Duke.
Ferguson, Dr. F. F., Biology, Norfolk College of William & Mary.
Fritz, Dr. R. L., Mathematics, Lenoir Rhyne.
Grochola, Mr. C. W., Long Island, N. Y.
Harrison, Dr. T. P., English, State College.
Heffner, Miss Madeline C., Biology, W. C. U. N. C.
James, Mr. B. H., Div. of Game and Inl. Fisheries, Robersonville.
Jordan, Mr. C. D., Zoology, Duke.
King, Dr. Willis, Dept. of Conser. & Develop., Raleigh.
Kinsman, Dr. Gladys M., Home Economics, W. C. U. N. C.
Kistler, Mr. J. W., Dept. of Conser. & Develop., Raleigh.
Knudsen, Mr. A. R., Agronomy, State College.
Kyker, Dr. G. C., Biological Chemistry, U. N. C.
Loeppert, Dr. R. H., Chemistry, State College.
Love, Miss Lila Bell, Biology, W. C. U. N. C.
McKnight, Dr. R. B., 403 N. Tryon St., Charlotte.
McLean, Mr. L. T., Horticulture, State College.
Mecklenburg Audubon Club, Charlotte.
Milam, Mr. F. M., Agronomy, State College.
Newcomer, Dr. E. H., Botany, U. N. C.
Phy-Chem Club, Durham High School.

Poole, Mr. F. G., Botany, U. N. C. (present address unknown).
Ray, Dr. Charles, Jr., Central Fibre Corp., Pisgah Forest.
Reardon, Dr. Anna J., Physics, W. C. U. N. C.
Rice, Dr. W. A., Geology, U. N. C.
Shamburger, Miss Anne, Hygiene, W. C. U. N. C.
Sigma Pi Sigma, Alpha Chapter, Davidson College.
Smith, Dr. B. E., Biology, Coker College, Hartsville, S. C.
Smith, Mrs. Susan Gower, Duke Medical School.
Spencer, Mr. C. G., Carthage.
Stainback, Mr. Raymond, Physics, U. N. C.
Stevens, Mr. R. O., Zoology, State College.
Taylor, Mr. M. H., Div. Game and Inl. Fisheries, Kinston.
Van Poole, Mr. T. B., Jr., Physics, Catawba.
Wauchope, Mr. Robert, Anthropology, U. N. C.
Webb, Dr. Bailey, State Laboratory of Hygiene, Raleigh.
Whitney, Dr. J. B., Jr., Central Fibre Corp., Pisgah Forest.
Zoology Field Club, W. C. U. N. C.

The Secretary was authorized to prepare a mimeographed list of the membership and distribute the same to departmental heads and other interested members.

The Committee authorized the Treasurer to purchase war bonds to the extent of $300.00 for our savings account. These are twelve year bonds with an initial expenditure of about $225.00. A balance of nearly $200.00 would be left in the savings account.

The Academy appointed Dr. E. W. Gudger to represent the Academy at the celebration of the 75th Anniversary of the Torrey Botanical Club in June.

The Committee makes the following recommendations:

1. That each member shall be limited to one paper on the general program at any one annual meeting.

2. That the recipient of the Poteat Award be announced as a part of the Proceedings.

3. That a committee be set up to consider the criteria for life membership.

4. That the following be elected to life membership in the Academy: S. C. Bruner and J. D. Ives.

5. That the following amendment to the Constitution be adopted:

Article II, section 1, to read:

(a) Members. Any person actively interested in science or the promotion of science, may, upon the payment of the annual dues of $2 and upon nomination by two members, be elected a member of the Academy by a majority vote of the Executive Committee, and shall be entitled to all the privileges of the Academy.

(b) Junior Members. Any person of high school grade who has shown unusual aptitude and accomplishment in some field of science may be elected to Junior Membership by a majority vote of the Executive Committee. Such membership is for the current year and there are no dues.

(c) Life Members. Members may be elected to life membership by the Academy upon nomination by the Executive Committee. Such election

relieves the member from further payment of dues, but does not invalidate his right to present papers, vote, and hold office.

(d) Sustaining Members. Institutions, organizations, or industrial concerns may be elected as sustaining members by the Executive Committee upon the payment of a nominal fee. All funds collected from this source are to be placed at the disposition of the Research Grants Committee.

(e) Patrons. Any person contributing a sum of $10 or more annually to the Academy may be elected by the Executive Committee as a Patron. All funds collected from this source shall be at the disposal of the Research Grants Committee.

(f) Affiliates. Active organizations having scientific objectives may upon application and the payment of annual dues ($2.00) be elected by the Executive Committee as affiliates. The affiliation may be renewed from year to year by action of the Executive Committee. Affiliated organizations shall be entitled to receive the Journal or some substitute and such notices as are issued to the members of the Academy. Each such affiliate shall be entitled to elect a delegate to the Academy who shall have the right to vote.

Article II, section 2, to be deleted. Refers to initiation fees.

Article II, section 3, to be renumbered 2 and the word "old" deleted.

Article II, section 4, to be deleted. Refers to patrons which are now covered in Section 1.

6. That the High School projects be continued.

7. That the Academy set up a special Committee to codify the Constitution and By-laws and perform related functions.

The recommendations were each adopted separately and then the report was adopted as a whole.

TREASURER'S REPORT

Expenditures

Seeman Printery (Stationery*)	$49.22
Stamps	6.00
Nell Starling (Sec. Asst.)	20.00
Duke University (Lantern slide boxes)	8.49
Nell Starling (Sec. Asst.)	15.00
Seeman Printery (File cards)	20.00
Mitchell Journal (Bonus)	50.00
Nell Starling (Sec. Asst.)	25.00
Intang. Tax	.23
Audubon Soc. (Lantern slides)	50.00
Seeman Printery (Stationery)	26.60
Bank charge	1.00
Waverly Press (Reprints of Proceedings)	8.70
Nell Starling (Sec. Asst.)	27.50
Naomi Mann (Sec. Asst.)	10.00
Rubber check	2.00
Ernest Hardwicke (H. S. Award)	20.00

*Includes stamped envelopes.

Marguerite Lyon (Sec. Asst.)	8.50
Stamps	3.00
Inez Wetmore (Sec. Asst.)	6.00
Seeman Printery (Announcements)	16.25
Bert Cunningham (Sec. Comm.)	12.00
Jour. E. M. S. S. (1942)	300.00
Bert Cunningham (Exp. at meeting)	8.30
Bert Cunningham (Sec. Comm.)	25.00
Bert Cunningham (Refund dues)	2.00
Naomi Mann (Sec. Asst.)	4.40
Zoology Department (Stencils, paper)	15.00
Bert Cunningham (Sec. Comm.)	20.00
Rose Agency	1.75
Naomi Mann (Sec. Asst.)	8.80
Bank charge	1.00
Seeman Printery (Programs)	37.50
Nell Starling (Sec. Asst.)	14.00
Nell Starling (Asst. at meeting)	5.00
Nell Starling (Sec. Asst.)	20.00
Total Expenditures	$848.24

The above bills were approved by President Coker who acted upon authorization of the of the Academy and they were then submitted along with other records to the Auditing Committee.

Receipts 1941-42

Bank Balance 6/1/41	$254.77
Back dues	18.00
Current dues	649.00
1943 dues	4.00
Mrs. E. B. Clarkson (slides)	50.00
Chemists (for program)	5.00
	$980.77

Summary of Accounts

Receipts:	
Bal. in bank 6/1/41	$254.77
Receipts	726.00
Total	$980.77
Expenditure:	
Total	$848.24
Bank balance 6/2/42	132.53
	$980.77

Savings Account

Balance 1/1/41	$416.81
Interest 1/1/41 to 1/1/42	7.31
	$424.12

AUDITORS' REPORT

On this 17th day of June, 1942, we have examined this account and found it to be correct.

JOHN B. DERIEUX
J. G. BOOMHOUR
DONALD B. ANDERSON, *Chairman*

REPORT OF THE RESEARCH GRANTS COMMITTEE

A majority of the Research Grants Committee has recommended that the A. A. A. S. fund be divided between E. E. Brown, Davidson College, and H. W. Jensen, Asheville Farm School. The studies which they wish to prosecute are as follows:

E. E. Brown—"Life history studies of the lizard, *Sceloporus u. undulatus* and the water snake, *Natrix septemvittata*." The fund is to be used for cages and other technical accessories.

H. W. Jensen—"Cytology of the genus *Ilex* with emphasis on the question of unisexuality and its influence on the meiotic process." The fund is to be used for cytological reagents and equipment.

O. C. BRADBURY
H. D. CROCKFORD
C. F. KORSTIAN
J. N. COUCH
B. W. WELLS, *Chairman*

REPORT OF THE REPRESENTATIVE ON THE COUNCIL OF THE A. A. A. S.

Your representative attended all the sessions of the Council. Since a complete report of the Council actions has been published, no further report seems necessary.

BERT CUNNINGHAM, *Representative*

REPORT OF THE COMMITTEE ON CONSERVATION

Last year your committee made a progress report or, more correctly, a report on lack of progress on two projects in which this Academy had shown its interest, namely, the Primeval Forest near Highlands and the Dismal Swamp. The former was referred to a special committee which has already reported (or is to make its report at this meeting).

The acquisition and protection of the Dismal Swamp seems necessarily postponed until the war is over, that is, unless it can be conclusively shown that a fire burning in this swamp, so close to the Norfolk area, would seriously disrupt Army, Navy and industrial activities by covering the region with a pall of smoke which might, in a dry season, last for weeks. A suggestion has already been made to the Government that steps to prevent such a catastrophe might well be considered a necessary part of our war effort.

Since no specific problems have been presented to our committee during the past year, it is deemed timely to call the attention of the Academy to the war time condition of our forest resources with the practical objective of extending so far as possible the benefits of productive timberlands into the post war period, when they will be so much needed. Not only is timber essential to the rebuilding of a civilization but such beneficient influence as erosion and flood control, the restoration of wild life, the use for recreation and aesthetic enjoyment must serve the world to the fullest extent possible. We are, therefore, presenting the following facts:

North Carolina has an approximate forest area of seventeen million acres, outside of the nearly one and a half million acres Federally owned and protected lands. Of this, some one-third is hardwoods and two-thirds pine, according to the Timber Survey made by the U. S. Forest Service in 1937. Even then the rate of growth was slightly less than the rate at which the timber was being used. With the increased use for war purposes it is estimated that this year the cut will exceed the growth by 147 million board feet; while the increased risk from fire due to the war, especially in our Coastal Plain Region, makes us all very apprehensive as to the probable post war conditions of our forests.

This matter is not presented with the thought that we should urge the saving of needed timber; rather we must cut and use every stick that can in any way contribute to the prosecution of this war, but this can and should be done without leaving the land unproductive. The object of this report is to call attention to the vital need of taking every precaution to conserve the resources from which future timber supplies must spring, i.e., the soil, the seed and the young growth of the forests that we are now cutting. If these fundamental assets are retained with as little injury to their reproductive capacity as possible the needs of the reconstruction period can be met; but if no care is given and everything salable is cut from the land without thought of any future crop and fire follows, as is especially likely in war time, then the next generation will be defrauded of its rightful heritage. To reconstruct the state or the world without forest resources would be a task too hard and dreary for us to be willing to leave to our children. Some of you will recall that one of the first contributions this country made in 1917 to the World War was the 10th Regiment of Engineers (Forestry) to be supplemented a little later by the 20th Engineers. These two regiments, officered and manned by American and Canadian foresters and lumber jacks, were sent to England and France where they operated in the woods behind the armies, getting out timbers, trees and lumber required for military purposes. While the main object was to get out timber as quickly and economically as possible, forestry principles continued to govern even the cutting of timber for war purposes. We need to be as careful of our forests as Europe was 25 years ago.

The three most important features of a war time forestry program are: (1) Fire control that will really protect the forests from fire, (2) cutting practices that will assure regeneration and succeeding forest crops, (3) close utilization that will waste nothing that has a use.

1. This state has a fire control organization extending more or less protection to the forests of 58 counties. It has had to operate on a state appropriation of $58,000, or less than one-half cent per acre of forest land covered. This is sadly inadequate for peace time conditions but with sabotage and direct attack more than a possibility, it is laying open to destruction our immense forest wealth to have no more money than that to give even ordinary protection to seventeen million acres of private forest land. The Governor of California has just approved an appropriation of over four million dollars to protect the forest wealth of that state.

2. Our methods of cutting timber for lumber, pulpwood, cross ties, fuel wood, etc., have improved very considerably in the past few years through the educational activities of the several State and Federal agencies which have been helping the landowner, but only the surface can be touched with the limited personnel available. Cutting methods must be adapted to each particular tract and should be determined in advance by the owner, with the advice of a forester. Clear cutting without adequate provision for regeneration is only justified where the land is to be cleared for agriculture, and timber stand improvement for fuel and other farm use is often desirable for making forests more productive. Cutting to a diameter limit for saw timber should be practiced only when the limit is large enough to assure that plenty of small trees will be left. Selective cutting can with advantage be adapted to many conditions. The principle of sustained yield or the regular production of annual maximum crops of timber over a long period of years should be the objective on most lands where ownership is fairly stabilized. The present supply of men competent to advise landowners would be sadly inadequate even in peace time but under war conditions, with the necessity of laying sound plans for restoration when peace is gained, more trained men are needed. State and Federal allotments for this educational and demonstration work should be increased.

3. High prices caused by war demands will do more to bring about close utilization than anything else. Low grade trees, which in normal times are unmarketable, can now be cut at a profit and the condition of the forest greatly improved by their removal. Even such usually waste material as tree tops and laps and slabs at the saw mills will find a market for fuel with supplies of coal and fuel oil greatly restricted.

Two other features of our state forestry program—i.e., land acquisition and forest planting, though necessarily delayed, must be carefully planned for, so that when peace comes an extended public forest policy can find constructive employment for the men released by war industries and the returning defenders of our country.

C. F. KORSTIAN
W. C. COKER
J. P. GIVLER
H. J. OOSTING
J. S. HOLMES, *Chairman*

The report was adopted.

REPORT OF THE HIGH SCHOOL COMMITTEE

The Committee has carried on its usual activities, although at a lower level. Only a part of the high school district meetings were attended by a representative of the Committee, but the state meeting was attended by C. F. Dodson who made the principal address.

Our attempts to organize science fairs this year have not been very successful, since, so far only one has been reported. We know that war conditions have been responsible for the discontinuance of others, and prevented still another from being organized.

The state has been pretty thoroughly canvassed by the Science Clubs of America, sponsored by Science Service, Inc., of Washington, D. C., and it may be desirable to yield the entire field to them. They can and do offer the science clubs more than we do in return for their dues. Perhaps we could do more by offering some journal or periodical other than the Mitchell Journal (which is quite beyond their level) as a part of their membership. Possibly funds could be secured for an inexpensive inter-club publication, which would be of considerable value in consolidating the work of the clubs. If Science Service follows the plan of the American Institute, which it claims to have taken over, the Academy will soon be faced with the problem of a Junior Academy of Science. Under these circumstances a special committee should be set up to study the situation.

The Committee is happy to announce the addition of a hand-colored set of slides on the Water Birds of North Carolina, to be added to our High School Loan Series. These were provided through the generosity of Mr. and Mrs. E. O. Clarkson of Charlotte, and of the North Carolina Bird Club. The syllabus was written by Mrs. M. W. Johnson.

The lantern slides provided by the North Carolina Forestry Association are excellent and have been well received by high school audiences. The Committee wishes to express its appreciation to the donors for both sets of slides.

While our slide loans have not been proportionately as large as last year, we have reached more schools and more students. The Committee feels that this is a very helpful project and urges that those members who can provide a series of slides in some field communicate with the Committee.

The Committee is glad to report that the North Carolina Forestry Association has continued its award for a meritorious essay written by a high school student on some subject related to forestry.

The Committee recommended to the American Association for Advancement of Science, that Lucille Weathers of the Garner High School and Bobby Wood of the Durham High School be made Honorary Junior Members of the Association. The recommendation was accepted and they were duly elected.

Both the meeting for high school teachers and the one for club sponsors last year were well attended. The discussions were helpful, and both meetings proved very successful. The Committee recommends that both meetings be continued as long as the interest is maintained.

At the time of the preparation of this report the Committee has no information concerning the possible entrants for the Academy award. Whether or not there are any the Committee suggests the continuation of the project.

The Committee recommends:

(1) That a special committee be set up to study the problem of a Junior Academy of Science. The Committee to report back to the Executive Committee before April 1, 1943. Adopted.

(2) That the Academy authorize the High School Committee to solicit funds for an inter-club publication, and if such funds become available to proceed with such publication. Adopted.

(3) That the Academy authorize the Secretary of the Academy to substitute some other magazine for the Elisha Mitchell Journal for club affiliates. Adopted.

(4) That the projects now under way, including the $20 Academy Award, be continued. Adopted.

(5) That the Academy express its appreciation to Mr. and Mrs. E. O. Clarkson and the North Carolina Forestry Association for their splendid cooperation with the High School Committee. Adopted.

M. L. BRAUN
C. F. DODSON
J. H. HIGHSMITH
R. J. SLAY
J. W. WOOD
B. CUNNINGHAM, *Chairman*

The report was adopted as a whole.

REPORT OF THE LEGISLATIVE COMMITTEE

The Committee has met by correspondence and the Chairman has consulted with various persons interested in our forests, streams, conservation, and publication of results of scientific investigation in our area and state, and support for the Academy.

The Committee recommends that the following program be adopted:

(1) That the North Carolina Academy of Science is in full sympathy with the program of the North Carolina Forestry Association and recommends such legislation as may be needed to carry out this program.

(2) That the North Carolina Academy of Science recommends the passage by the Legislative body of the bills sponsored by T. S. Johnson, Chief Engineer of the Department of Conservation, and W. H. Booker, Chief Engineer of the Health Department, for the control and abatement of stream pollution.

(3) That the Academy authorize the Legislative Committee or whoever the Academy may select or appoint to request the Legislature to make available annually a sum of money for the support of the State Academy, to be used for the publication of the results of research in the state and for grants-in-aid for useful research in the state. This sum to be administrated by the Executive Committee of the Academy.

(4) That the Legislative Committee be authorized to inform the Legislature and the Budget Committee and the Advisory Budget Committee of the need for funds by the several branches of the Department of Conservation and Development which are engaged in basic research for publication of said research.

(5) That members of the Academy call attention, in writing, of the Legislative Committee to any suggestion they may have in keeping with the work of the Committee.

R. W. BOST
H. F. PRYTHERCH
B. W. WELLS
WILLARD BERRY, *Chairman*

The report was adopted.

At this point the following resolution was presented by Willard Berry and C. F. Korstian:

RESOLVED that the North Carolina Academy of Science recognizes the vital need for timber, not only in the prosecution of the war, but in reconstruction after the war and especially in the future. We, therefore, endorse the forestry program of the State Department of Conservation and Development and the North Carolina Forestry Association. The Academy pledges its support in the aid of this program. The Legislative Committee is hereby authorized to cooperate with the North Carolina Forestry Association in the attainment of this program.

The resolution was adopted.

REPORT OF THE REPRESENTATIVE TO THE ACADEMY CONFERENCE

The Academy Conference held its fifteenth annual session in the Baker Hotel in Dallas, Texas, on the afternoon of December 29, 1941. Twenty-one Academies were represented, and the A. A. A. S. was represented by four members of the Executive Committee.

In the absence of President P. D. Strausbaugh of the West Virginia Academy of Science, Vice-chairman S. W. Bilsing of the Texas Academy of Science presided at the Conference.

The formal program consisted of two papers, one by Dr. E. C. Faust (New Orleans Academy), on "A Resumé of A. A. A. S. Research Grants," and the other by Dr. J. C. Godbey (Texas Academy), on "The Organization of a Collegiate Division of the Texas Academy of Science."

The paper presented by Dr. E. C. Faust was a continuation report of a paper presented at the Columbus, Ohio, Academy Conference in 1939. In this report the following facts were brought out: First, that very little money for research is added by the respective Academies to the grants allotted them by the A. A. A. S. Second, there is very little evidence that research projects reach the publication stage except as abstracts in Academy Transactions. Third, with few notable exceptions, Secretaries have great difficulty in obtaining progress reports from Grants Committees or directly from grantees. In some instances there is definite evidence of poor record keeping in Secretaries' offices; in some instances, poor cooperation between Grants Committees and Secretaries; in many instances, utter disregard on the part of grantees for requested information.

The following recommendations were presented:

(1) A. A. A. S. Executive Committee and Academies (as local representatives of A. A. A. S.) should give serious consideration to allotment of rewards with reference to responsibility of grantees to provide annual (or semi-annual) progress reports to Research Grant Committee or Secretary of Academy.

(2) Closer cooperation is needed between Research Grant Committee and Secretary of Academy. The Committee and Secretary should have readily available up-to-date duplicate files of status of each grant from 1935.

(3) In the future Mr. Woodley's office of the A. A. A. S. should be the clearing office for all such reports to the Academy Conference.

In the discussion that followed this paper Roger C. Smith (Kansas Academy) reported that his Academy does not give the amount of the grant in a lump sum

to the grantee, but allots the grant and permits the grantee to issue bills to the Secretary of the Academy against the amount allotted to him.

It was suggested that next year a report be given in the Academy Conference concerning the best method for handling grants. Accordingly it was moved and voted that the Chairman appoint a committee to make a study and report back to the Academy Conference next year an effective means of deciding to whom grant allotments are to be made, and how to handle these allotments. An amendment was voted to the above motion that the committee try to evaluate in addition any other things pertaining to the grant situation that were not mentioned in the above motion. Subsequently Dr. G. W. Prescott (Michigan Academy) was appointed as chairman of this committee and was authorized to get information from and enlist the services of any one he may choose to help canvass the situation and submit recommendations concerning the handling of research grants.

Dr. J. C. Godbey, in his discussion of "The Organization of the Collegiate Division of the Texas Academy of Science," reported that this division was organized in 1936, but showed its largest growth during the past year.

Any science club or society in any College or University of Texas, having a membership of ten or more student members, at least five of whom are members of the Texas Academy of Science, is eligible to membership in the Collegiate Division and is called a Chapter.

Each organization is allowed one official delegate to the annual meeting for each ten members. The annual meeting is concurrent with that of the Texas Academy of Science, at which time sectional meetings for the reading of papers and reports and a business session are held.

The Texas Academy issues a charter to each Chapter on its becoming an approved member of the Division.

Each student member of a chapter who is also a member of the Texas Academy of Science pays an annual student membership fee of one dollar to the Texas Academy.

At the complimentary dinner which followed the last report, the nominating committee consisting of Doctors Lyell Thomas (Illinois Academy); Septima Smith (Alabama Academy); and E. C. L. Miller (Virginia Academy) submitted the name of G. W. Prescott (Michigan Academy) as their nominee for vice-chairman. There being no other nominations Dr. Prescott was duly elected vice-chairman for 1942.

Dr. E. C. L. Miller (Virginia Academy) reported, for the Committee on Junior Academy Relationships, that nothing was accomplished since the American Institute passed out of the picture. Dr. Miller's resignation as chairman of the committee was accepted. At this time Watson Davis of Science Service, representing the Science Service, was given permission to explain the relationships his organization proposes to maintain with the various Junior Academy organizations. After considerable discussion and by common consent a committee consisting of President S. W. Bilsing; Vice-chairman G. W. Prescott; Permanent Secretary, A. A. A. S., F. R. Moulton; and General Secretary, A. A. A. S., Otis

W. Caldwell, was authorized to assist in selecting a committee to study the Junior Academy situation. The committee thus formed consists of Lyell J. Thomas, Chairman (Illinois Academy); G. W. Prescott (Michigan Academy); William G. Camp (Maryland Academy); G. L. Cross (Oklahoma Academy); R. C. Smith (Kansas Academy); Mrs. E. Barry Walker (Commerce, Texas); H. E. Enders (Indiana Academy); E. C. L. Miller (Virginia Academy); D. B. Lawrence (Minnesota Academy), and Anna A. Schneib (Kentucky Academy).

BERT CUNNINGHAM, *Representative*

The report was adopted.

REPORT OF SPECIAL COMMITTEE ON PRIMEVAL FOREST

Your "Special Committee on The Primeval Forest," appointed in compliance with a resolution adopted at last year's business meeting, has unfortunately little progress to report.

The Ravenel Tract, known as the Primeval Forest, lies on the south side of highway No. 64, some five miles east of Highlands, N. C. It is partly surrounded by the Nantahala National Forest and therefore eligible for purchase by the Forest Service. The whole property contains some 1700 acres, but since the death of Mr. Samuel Prioleau Ravenel, the former owner, his widow has arranged with Mr. William P. Pierson of Highlands, to exempt the northern part of the tract which contains the lake, and a proposed residential development through which the highway runs.

On August 18 last, Dr. W. C. Coker and the chairman called on Mr. Pierson in Highlands and he showed us a sketch map of the property, a copy of which we later secured. A blueprint of this map, redrawn, is herewith submitted.* The owner seems to have more than one way of dividing the property for which the map shows two six-hundred acre tracts outside the reserved area. Mr. Pierson discussed with us a possible 847 acres to include the Primeval Forest and Whiteside Mountain. Mr. Pierson accompanied us to High Hampton Hotel at Cashier's Valley to see Mr. Julian Miller, of Charleston, S. C., attorney for Mrs. Ravenel, and a brother-in-law of hers. Mr. Miller stated that Mrs. Ravenel was offering 700 acres, including the Primeval Forest but excluding the lake, at $57.00 per acre. In our conversation with Mr. Miller, we stated that no money was now available for the purchase of this tract although the U. S. Forest Service was interested in its acquisition but that probably the maximum price that they could pay would not exceed $25.00 per acre. This would be based upon a careful estimate of the timber and other values. It was suggested by us that Mrs. Ravenel consent to sell to the government at the maximum price they might offer and donate such other values as she felt there were in the property for the privilege of naming the area for her husband and his family in recognition of the high service he and they had rendered in reserving this unique tract of virgin timber. Mr. Miller promised to see Mrs. Ravenel and let us know her attitude. Later we were advised through Mr. Pierson that the owner was unwilling to sell the 1200 acres, excluding the lake and proposed residential site, for $25.00 per acre, as pro-

*This map is too large to be published in the Proceedings.

posed by us. "The price of the 1200 acres at the present time (September 15), Mr. Pierson wrote, "is $60,000 cash." This absolutely unreasonable position seemed to close the door and nothing was done by your Committee through the winter. Rather recently we have heard through a connection of the family, that while no concession has yet been made in price, Mrs. Ravenel has stated that she will not sell the timber for lumbering. Under these circumstances it has not seemed necessary or advisable to call the whole committee together, but the chairman recently conferred with the other Raleigh member and we agreed to recommend the continuance of the Committee so that any favorable change in the situation might be turned to advantage. We would also like to recommend that the Ecological Society of America and the Academies of our near-by sister states be invited to lend such aid as they may be in a position to offer.

B. W. WELLS
O. C. BRADBURY
H. J. OOSTING
A. F. THIEL
LIONEL WEIL
BERT CUNNINGHAM
J. S. HOLMES, *Chairman*

The report was adopted.

Dr. Holmes then presented the following resolution:

That the Special Committee be continued and that it be instructed to solicit such interest and aid from other organizations, especially the Ecological Society of America and the Academies of Virginia and South Carolina, as they may be able and willing to give.

The resolution was adopted.

REPORT OF A SPECIAL RESOLUTIONS COMMITTEE

In the death of Charles Wardell Stiles, January 24, 1941, the world lost a most worthy contributor to the advancement of zoology, particularly in its relation to public health. He first showed that the inefficiency of people in many rural districts in the southeastern United States was due to hookworm infestations. He was responsible for founding of the Rockefeller Sanitary Commission (1909–1914), which later expanded into the International Health Board and uplifted backward peoples throughout the world. He also gave notable service as secretary of the International Commission on Zoological Nomenclature (1898–1930).

Dr. Stiles was born in Spring Valley, N. Y., May 15, 1867. He attended Wesleyan (1885–1886), College de France (1886–1887), Berlin Universitat (1887–1889), and received A. M. and Ph. D. degrees at Leipzig (1890) and M. D. in Paris (1896). He also held honorary M. S., S. C. D., LL.D., and M. D. degrees from Wesleyan, North Carolina, Richmond, and Yale.

In various capacities Dr. Stiles gave outstanding service to mankind: Zoologist, United States Bureau of Animal Industry (1891–1902); Professor Medical Zoology, Georgetown University (1892–1906); Zoologist, United States Public Health Service (1902–1910), Assistant Surgeon General (1919–1930), Medical

Director (1930); Professor of Zoology, Rollins College (1932–1938). He was Honorary Custodian of Helminthological Collections in the United States National Museum (1893–1930); Lecturer, Army Medical School (1894–1901), Johns Hopkins (1897–1937), Navy Medical School (1902–1917). In 1898–1899 he served as Agricultural and Scientific Attaché at the United States Embassy in Berlin. He was delegate to the International Scientific Congresses in Leyden (1895), Cambridge (1898), Berlin (1901), Berne (1904), Boston (1907), Budapest (1927), and Padua (1930).

Dr. Stiles was a member of the American Society of Zoologists, Fellow of the Royal Society of Tropical Medicine, Corresponding Member of the Zoological Society of London, three French societies, and various others. He was a member of the North Carolina Academy of Science from 1910 to 1941, and was elected a life member in 1932.

The North Carolina Academy of Science regrets the loss of one who has passed a long and useful life and records its pride in his notable attainments, which we all honor.

STERLING BRACKETT
ARCHIE SHAFTESBURY
A. S. PEARSE, *Chairman*

The resolution was adopted by a rising vote.

REPORT OF THE POTEAT AWARD COMMITTEE

Your committee on the Poteat Award makes the following report:

The award for 1942 shall be awarded J. P. Decker of Duke University for his paper on "The Effect of Temperature on Photosynthesis in Red and Loblolly Pines."

Your committee wishes to call attention to the difficulty of arriving at a decision because of the organization of the Academy into sections. We urge the adoption of some more feasible plan by which satisfactory decisions may be reached.

D. K. ADAMS
WILLARD BERRY
M. L. BRAUN
E. H. HALL
E. L. MACKIE
G. H. SATTERFIELD
W. L. PORTER, *Chairman*

Although this report was not given at the meeting, the Secretary was instructed to include it in the Proceedings of the Academy.

The Secretary was also instructed to publish the complete list of the recipients of this award which follows:

POTEAT AWARDS

1936. F. G. Hall (Duke), Physiological Studies at High Altitudes.
1937. J. N. Couch (U. N. C.), A Fungus that Catches Nematodes. Jour. E. M. Sci. Soc. **53**: 301.

1938. H. F. Prytherch (U. S. B. F.), Life Cycle of a Sporozoan Parasite of the Oyster. Jour. Morph. **66:** 39–62.

1939. F. H. McCutcheon (State College), Respiratory Mechanism in the Grasshopper. Ann. Amer. Entomol. Soc. **33:** 35–55.

1940. N. F. Conant (Duke), A Case of Darling's Histoplasmosis Caused by *Histoplasma capsulatum* in a Three Months Old Infant. Jour. Bacter. **41:** 563–579.

1941. Alma Whiffen (U. N. C.), The Role of Chytrids in Cellulose Decomposition. Jour. E. M. Sci. Soc. **57:** 321–330.

1942. John P. Decker (Duke), The Effect of Temperature on Photosynthesis in Red and Loblolly Pines.

REPORT OF THE COMMITTEE ON NOMINATIONS

In considering the important subject entrusted to your Committee on Nominations, it was found that with a present 20% membership of women, only three times had a woman been elected to any office in the forty-year life of the Academy. It was also found that most of the offices have been going to the Big Six Colleges, namely, the three of the Greater State University, with Duke, Wake Forest, and Davidson. These conditions might be looked upon as discouraging membership from the smaller colleges and institutions. However, on studying Academy activity, the disparity was not as great as appeared on the surface, that is, few women or members of the smaller colleges had maintained continuous membership, had attended regularly, or had contributed papers.

Your Committee, therefore, in presenting the following slate, desires to encourage our women members and the representatives of our small colleges to take a more active part in the meetings and affairs of the Academy.

Your Committee desires to make the following nominations:

For President: Dr. H. F. Prytherch, Director, U. S. Marine Laboratory, Beaufort, N. C.

For Vice-President: Dr. Eva G. Campbell, Guilford College.

For Secretary-Treasurer: Dr. Bert Cunningham, Duke University.

For Member of Executive Committee: Prof. O. J. Thies, Jr., Davidson College.

For Member of Research Grants Committee: Prof. J. P. Givler, Woman's College U. N. C.

For Representative on Council A. A. A. S. and the Academy Conference: Bert Cunningham, Duke University.

JAMES B. BULLITT
P. M. GINNINGS
JOHN S. HOLMES, *Chairman*

After the reading of this report the President called for nominations from the floor. It was moved, seconded, and carried that nominations be closed and that J. B. Bullitt be instructed to cast an unanimous ballot for the nominees.

Dr. Bullitt reported that such a ballot was cast.

REPORT OF THE RESOLUTIONS COMMITTEE

The North Carolina Academy of Science wishes to express its appreciation for the pleasant entertainment received at the Woman's College of the University of North Carolina. The local committee has worked most efficiently to make us

enjoy our visit, through the excellent facilities provided for the meeting, the splendid exhibits, the complimentary dinner, and the general good fellowship. We wish also to express our appreciation to Dean W. C. Jackson and the administration of the college, also to the Greensboro Chamber of Commerce and Mr. J. S. Patterson for the interest shown in the visit of the Academy and to Miss Craig who handled our press notices so efficiently.

W. C. GEORGE
C. H. HIGGINS
E. G. CAMPBELL, *Chairman*

The resolution was adopted.

The Academy then adjourned for the complimentary dinner provided by the Woman's College.

President Coker announced the winners of the High School exhibits award. They were Ernest Hardwicke and Arthur Budlong who exhibited jointly a home-made stroboscope. Other exhibits which should be especially mentioned were (1) an unusual group of photographs presented by Donald Hartzog of the Winston-Salem High School; (2) Indian arrow heads collected by Edgar Hayes of the High Point High School; and (3) Miniature replicas of fire arms made by Joe Fidel of the High Point High School.

The Academy met in its customary night session to hear the Presidential Address. A. D. Shaftesbury, Chairman of the local general committee, presided at this meeting in the absence of C. N. Warfield, Vice-President of the Academy, who was absent on account of war duties. The Chairman introduced Dean W. C. Jackson of the Woman's College who extended a welcome to the Academy. R. E. Coker, President of the Academy, then delivered his Presidential Address. At the close of the meeting refreshments were served and a social hour enjoyed. Perhaps the "black-out" in the middle of this social affair added to its zest. The feeling prevalent as the party broke up was that we had all had a pleasant and profitable day.

The various Sections met on Saturday for sessions of variable lengths. All had good programs and unexpectedly large attendance. The new section on Wildlife was especially gratifying.

At the request of several members of the Academy the Secretary is giving here a list of the recent meeting places of the Academy:

Greensboro, 1935; Duke, 1936; Catawba, 1937; State, 1938; Wake Forest, 1939; Davidson, 1940; Carolina, 1941; Greensboro, 1942.

The personnel of the standing committees follows:

Executive: H. F. Prytherch, Eva G. Campbell, Bert Cunningham, A. S. Pearse, D. B. Anderson, O. J. Thies.

Research Grants: J. N. Couch (1944), Chairman, O. C. Bradbury (43), H. D. Crockford (43), C. F. Korstian (44), J. P. Givler (45).

The following sectional officers were elected by the respective groups:

Botany: Chairman, Earl H. Hall; Secretary, E. C. Cocke (45). Attendance, about 45.

Biochemistry and Physiology: Chairman, C. Artom; Secretary, J. C. Andrews (45). Attendance, about 15.

Geology: Chairman, H. T. Davis; Secretary, Willard Berry (45). Attendance, about 15.

Mathematics: Chairman, none elected; Secretary, J. W. Lasley, Jr. (43). No meeting.

Physics: Chairman, A. L. Hook; Secretary, F. W. Lancaster (45). Attendance, about 25.

Psychology: Chairman, K. L. Barkley; Secretary, Karl Zener (45). Attendance, about 40.

Wildlife: Chairman, Willis King; Secretary, R. O. Stevens (45). Attendance, 35–40.

Zoology: Chairman, O. C. Bradbury, Secretary, Eva G. Campbell (45). Attendance, about 30.

High School Science: Chairman, J. W. Wood; Secretary, Nellie D. Blackburn. Attendance, 15.

President H. F. Prytherch announces the following committees to serve during 1942–43.

Auditing Committee:
Speas, W. E., *Chairman*, Wake Forest College, Wake Forest, N. C.
Bradbury, O. C., Wake Forest College, Wake Forest, N. C.
Mackie, G. C., Wake Forest College, Wake Forest, N. C.

Conservation Committee:
Holmes, J. S., *Chairman*, State Forester, 302 Forest Road, Raleigh, N. C.
Baity, H. G., Chapel Hill, N. C.
Korstian, C. F., Forestry, Duke University, Durham, N. C.
Gordon, Seth, Jr., N. C. Department of Conservation & Development, Raleigh, N. C.
Brimley, H. H., State Museum, Raleigh, N. C.

High School Science Committee:
Buell, M. F., *Chairman*, State College, Raleigh, N. C.
Braun, M. L., Catawba College, Salisbury, N. C.
Dodson, C. F., Western Carolina Teachers College, Cullowhee, N. C.
Highsmith, J. H., Department of Education, Raleigh, N. C.
DeLoach, W. S., East Carolina Teachers College, Greenville, N. C.
Conner, Elizabeth, High Point, N. C.

Legislative Committee:
Berry, Willard, *Chairman*, Duke University, Durham, N. C.
Wells, B. W., State College, Raleigh, N. C.
Burgess, B. C., United Feldspar and Minerals Corp., Spruce Pine, N. C.
Rosenau, M. J., University of North Carolina, Chapel Hill, N. C.

Necrology Committee:
Beers, C. D., *Chairman*, University of North Carolina, Chapel Hill, N. C.
Brandt, B. B., East Carolina Teachers College, Greenville, N. C.
Wyatt, W. J., Jr., Wake Forest College, Wake Forest, N. C.

Bookout, C. J., Duke University, Durham, N. C.
West, Gladys F., State College, Raleigh, N. C.
Sprague, A. D., Elon College, N. C.
Barrow, E. E., W. C. U. N. C., Greensboro, N. C.
Arbuckle, H. B., Davidson College, Davidson, N. C.
Ullman, R. R., Lenoir Rhyne College, Hickory, N. C.
Cleaver, Mrs. W. J., Catawba College, Salisbury, N. C.

Nominating Committee:
Coker, R. E., *Chairman*, University of North Carolina, Chapel Hill. N. C.
Wolf, F. A., Duke University, Durham, N. C.
Stuckey, J. L., State College, Raleigh, N. C.

Poteat Award Committee:
Shaftesbury, A. D., *Chairman*, W. C. U. N. C., Greensboro, N. C.
Gray, Irving E., Duke University, Durham, N. C.
Dashiell, J. F., University of North Carolina, Chapel Hill, N. C.
Braun, M. L., Catawba College, Salisbury, N. C.
Bradbury, O. C., Wake Forest College, Wake Forest, N. C.
Hood, Frazer, Davidson College, Davidson, N. C.
Satterfield, G. H., State College, Raleigh, N. C.
MacCarthy, G. R., University of North Carolina, Chapel Hill, N. C.
Kramer, P. J., Duke University, Durham, N. C.

Committee on Resolutions:
George, W. C., *Chairman*, University of North Carolina, Chapel Hill, N. C.
Metcalf, Z. P., State College, Raleigh, N. C.
Gravette, H. L., Elon College, N. C.

Committee on Primeval Forest:
Holmes, J. S., *Chairman*, 302 Forest Road, Raleigh, N. C.
Wells, B. W., State College, Raleigh, N. C.
Bradbury, O. C., Wake Forest College, Wake Forest, N. C.
Oosting, H. J., Duke University, Durham, N. C.
Thiel, A. F., W. C. U. N. C., Greensboro, N. C.
Weil, Lionel, 611 Park Avenue, Goldsboro, N. C.
Spencer, Colin J., N. C. Forestry Assoc.

Junior Academy Committee:
Dodson, C. F., *Chairman*, Western Carolina Teachers College, Cullowhee, N. C.
Heck, C. M., State College, Raleigh, N. C.
Hall, E. H., W. C. U. N. C., Greensboro, N. C.
Wilson, Dorothy, Durham High School, Durham, N. C.
Howe, M. D., Queens College, Charlotte, N. C.

Life Member Qualification Committee:
Pearse, A. S., *Chairman*, Duke University, Durham, N. C.
Ferrill, H. W., University of North Carolina, Chapel Hill, N. C.
Satterfield, G. H., State College, Raleigh, N. C.
Mackie, G. C., Wake Forest College, Wake Forest, N. C.
Arundel, Miss Edna, W. C. U. N. C., Greensboro, N. C.

Constitutional and Secretarial Committee:

Totten, H. R., *Chairman*, University of North Carolina, Chapel Hill, N. C.
Blomquist, H. L., Duke University, Durham, N. C.
Cunningham, Bert, Duke University, Durham, N. C.

The following papers were presented during the meeting. Those marked with an x are abstracted in the Proceedings; those marked with an * are published in full.

GENERAL SESSIONS

Address of Welcome. W. C. JACKSON, Dean of Administration of the Woman's College of the University of North Carolina

Presidential Address. What are the Fittest? R. E. COKER, President of the Academy

Strawberry growth as affected by mineral nutrition. R. A. LINEBERRY AND LELAND BURKHART, Dept. of Agric.

x*Important North Carolina raw materials and manufacturing facilities available for war use.* E. E. RANDOLPH, State.

x*An abnormally large chicken liver.* E. C. COCKE, Wake Forest.

x*The pulling strength of nails of different size and depth.* J. B. DERIEUX, State.

x*Growth and nutrition of the peanut plant.* LELAND BURKHART, State.

Tropical opossums (colored film by Wistar Institute). A. D. SHAFTESBURY, Woman's College.

Vitamin C in strawberries and other small fruit grown in North Carolina. LELAND BURKHART, R. A. LINEBERRY, Dept of Agric.

Factors inhibiting the invasion of spruce-fir forest by maple-basswood reproduction and ground cover. M. F. BUELL AND W. E. GORDON, State and Minnesota.

x*The fauna of sand beaches at Beaufort.* A. S. PEARSE, Duke.

x*Ecological studies of bacteria of ocean beaches at Beaufort, N. C.* H. J. HUMM, Duke.

x*Construction and operation of a solar heating unit.* L. B. RHODES, N. C. Dept. of Agric.

x*More detailed studies of the meteorological contrasts of day and night.* C. M. HECK, State.

Ecological studies of virgin forests. H. J. OOSTING, Duke.

BIOCHEMISTRY AND PHYSIOLOGY

Dietary factors in the formation of liver phospholipids. C. ARTOM AND W. H. FISHMAN, Wake Forest.

*x*A study of the gross physiological reactions of lower organisms to the antisulfonamide, para-amino-benzoic acid.* E. M. LAVOR, F. F. FERGUSON, AND V. VAN ALDERMAN, Norfolk General Hospital, W. and M., and V. P. I.

x*Variations in the nature of soil colloids of North Carolina and their relation to plant growth.* A. MEHLICH AND F. M. MILAM, State.

Nicotinic acid in milk. E. A. BAILEY, JR. (in collaboration with G. H. SATTERFIELD, W. J. DANN, C. D. GRINNELLS), State and Duke.

x*The enzymatic decomposition of quinine in vitro and in vivo.* JAMES C. ANDREWS AND C. E. ANDERSON, Carolina.

A porometer study of cotton stomates. B. F. VOLKERDING AND D. B. ANDERSON, State.

Action of brominated fatty acids on liver fat. C. ARTOM AND M. SWANSON, Wake Forest.

**Further notes on the reactions of certain lower organisms to the common sulfonamides.* E. M. LAVOR AND F. F. FERGUSON, Norfolk General Hospital and W. and M.

x*A study of the sulfonamide inactivating groups of para-amino-benzoic acid* (to be read by title). V. VAN ALDERMAN, E. M. LAVOR, AND F. F. FERGUSON, V. P. I., Norfolk General Hospital, and W. and M.

BOTANY SECTION

x*Panicum Bennettense, a new species from North Carolina.* W. V. BROWN, Greensboro College.

x*Experiments with control measures for Granville wilt of tobacco.* T. E. SMITH, N. C. Agr. Expt. Station.

The effect of temperature on photosynthesis in red and loblolly pines. J. P. DECKER, Duke.

x*A discussion of some species of Olpidiopsis and Pseudopidium.* ALMA J. WHIFFEN, Carolina.

x*Osmotic pressure and D. P. D. relations in cotton bolls.* T. KERR AND D. ANDERSON, State.

x*Some blue-green algae which have not been reported for North Carolina.* E. C. COCKE AND F. E. LEATHERWOOD, Wake Forest.

The freshwater algae of North Carolina. L. A. WHITFORD, State.

A new type of life cycle in Blastocladiella. J. N. COUCH AND ALMA J. WHIFFEN, Carolina.

A cytological survey of some bud sports in apple. E. H. NEWCOMER, Carolina.

x*The effect of light intensity on photosynthesis in pine and oak seedlings.* P. J. KRAMER AND J. P. DECKER, Duke.

x*Some additions to the dicotyledonous flora of South Carolina.* B. E. SMITH, Carolina.

An inexpensive recording manometer for measuring stomatal apertures. C. C. WILSON, Duke.

GEOLOGY SECTION

x*An unusual brown iron ore deposit.* J. W. HUDDLE, Carolina.

x*Reviewing the North Carolina coastal plain geology.* HARRY DAVIS AND H. G. RICHARDS, State Museum.

x*Economic geology of the North Carolina peridotites.* T. G. MURDOCK, Dept. Conservation.

x*The geomagnetic disturbance of August 4, 1941, as observed in North Carolina and in Oregon.* G. R. MACCARTHY, Carolina.

Recent developments in North Carolina mineral resources. J. L. STUCKEY, State.

x*Geology of three wells in the coastal plain.* WILLARD BERRY, Duke.

PHYSICS SECTION

Atomic form factors for electron diffraction. L. W. NORDHEIM AND C. FRY, Duke.

The spectrum of helium excited by alpha particles. A. E. RUARK, Carolina.

On the validity of correlating Raman lines in series of substituted methanes. GERTRUDE NORDHEIM AND H. SPONER, Duke.

x*The results obtained with the concave grating spectrograph of the Central Scientific Company.* J. B. DERIEUX, State.

Classical equations of motion of electron. NATHAN ROSEN, Carolina.

PSYCHOLOGY SECTION

Panel Discussion: "Psychological Aspects of Morale"

Plus and minus factors for morale in our national life. W. W. MARTIN, Woman's College.

Morale in democratic vs. authoritarian society. D. K. ADAMS, Duke.

Worry as a neglected factor in morale. ENGLISH BAGBY, Carolina.

Some imponderables influencing morale. E. W. STRAUSS, Black Mountain College.

x*Experimental evidence for functional autonomy of motives.* DOROTHY RETHLINGSHAFER, Carolina.

Development of the moral judgment of college students. KEY L. BARKLEY, Woman's College.

Cooperative problem solving in rats. W. J. DANIEL, Carolina.

x*Effects of organization upon the memory of meaningful material.* CLYDE MONTGOMERY AND KARL ZENER, Duke.

A factor analysis of some measures of muscular tension. ELIZABETH DUFFY, Woman's College.

x*Some experimental problems in military psychology.* A. G. BAYROFF, Carolina.

Some constant factors in learning. J. F. DASHIELL AND W. F. DUKES, Carolina.

ZOOLOGY SECTION

A study of the cytology of Toxocara cati Brumpt. C. M. ALLEN, Wake Forest.

The gonads of the beetle, Passalus cornutus Fabricius. J. B. KRAUSE, Duke.

Distribution and variation of the rabbit fleas of eastern United States. A. D. SHAFTESBURY, Woman's College.

x*The respiratory mechanism in turtles.* F. H. MCCUTCHEON, State.

Studies on salamander locomotion. F. G. EVANS, Duke.

x*Anatomy and taxonomy of two species of the new genus Pregermarium (Turbellaria, Alloeocoela) from Beaufort (N. C.) Biological Station* (to be read by title). MARGARET A. STIREWALT, F. F. FERGUSON AND W. A. KEPNER, Flora MacDonald, W. and M., Virginia.

x*Notes on the Turbellarian fauna of Rochester (N. Y.); Anatomy of Macrostomum ontarioense* (to be read by title). F. F. FERGUSON, W. and M.

WILDLIFE SECTION

x*Forage utilization by the white-tailed deer of the Appalachian Region.* E. A. SCHILLING, U. S. Forest Service.

x*Thirty million acres of undiscovered wildlife-land in the U. S.* (Illustrated). V. E. DAVISON, U. S. Soil Conservation Service.

x*Program for the management of North Carolina Inland Fisheries.* WILLIS KING, Department of Conservation and Development.

x*The accomplishments of the North Carolina Cooperative Farm-game Program since 1937.* J. C. DARSIE, N. C. Division of Game and Inland Fisheries.

x*Research dealing with North Carolina fur-bearing animals.* JOE C. RABB, N. C. Division of Game and Inland Fisheries.

x*Zoological factors in deer research.* SETH GORDON, Jr., N. C. Division of Game and Inland Fisheries.

The Pittman-Robertson Program in North Carolina. F. W. EATMAN AND R. O. STEVENS, N. C. Division of Game and Inland Fisheries.

x*The mourning dove in North Carolina.* M. H. TAYLOR AND W. J. MAJURE, N. C. Division of Game and Inland Fisheries.

HIGH SCHOOL SCIENCE TEACHERS

(Sponsored by the North Carolina Academy of Science)

1. *Science Program for a twelve-year High School.* NELLIE D. BLACKBURN.
2. *Correlation of science with vocational subjects.* CLARA WHITEHEAD.
3. *Activities at the Duke Marine Laboratory (Beaufort, N. C.).* (Moving picture). A. S. PEARSE, Director.
4. *A possible role of ecology in biology course.* J. P. DECKER.
5. *Evaluation of audio-visual aids for teaching science in the High School.* CHARLES F. MILNER.

HIGH SCHOOL SCIENCE CLUB SPONSORS

(Sponsored by the North Carolina Academy of Science)

1. *High School science clubs and defense.* D. F. KELLER.
2. *Co-operation between the various science clubs* (by title). C. F. DODSON.
3. *Round table.* C. F. DODSON, presiding.
4. Club reports
   (a) Dorothy Wilson, Durham
   (b) Beverly Steinert, Mt. Airy
   (c) Volunteers

NORTH CAROLINA SECTION OF THE AMERICAN CHEMICAL SOCIETY

1. *A column for stripping solvent from oils.* F. H. SMITH, North Carolina Agricultural Experiment Station, Raleigh.
2. *Chemical changes accompanying cucumber fermentation.* IVAN D. JONES, Department of Horticulture, N. C. State College, and J. L. ETCHELLS,

Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, Raleigh.

3. *Heteropoly-acids of Columbium and Tantalum.* F. H. EDMISTER, University of North Carolina and C. P. TEBEAU, University of Georgia.
4. *Statistical methods applied to animal assays.* F. W. SHERWOOD, North Carolina Agricultural Experiment Station, Raleigh.
5. *The reactivity of Alpha-, Beta-unsaturated ethers with Grinard reagents.* CARL M. HILL, Agricultural and Technical College, Greensboro.
6. *Aqueous solubilities of some aliphatic esters.* P. M. GINNINGS, THELMA MORRISON AND DOROTHY SMITH, Greensboro College.
7. *The structures of cellulose; mercerization.* SHERMAN E. SMITH, University of North Carolina.
8. *Reactions of atomic hydrogen.* F. H. EDMISTER, University of North Carolina and GEORGE L. CHURCH, Philadelphia Salt Company.
9. *A quantitative test for the bromine ion.* HARVEY LJUNG, Guilford College.

Important North Carolina Raw Materials and Manufacturing Facilities Available for War Use. E. E. RANDOLPH.

At this critical time when the very existence of our government and all that it means to our freedom of thinking and action are at stake, it is necessary that all of our physical and mental ability, all of our materials, and all of our energies are put to the utmost use to defend and preserve our freedom and our principles of life.

We should explore to the limit our natural resources, our necessary materials, our present manufacturing advantages and facilities, and our opportunities for making other necessary materials and the making of those resources available for the present crisis. In this effort we should of course as far as possible create industries which may later contribute to permanent advantage of our people. On the other hand if we have vital materials which the government needs we should find a way to make them available even if it should be inadvisable to continue the enterprise after the war.

We should investigate the advisability of working our tin ore for immediate production. Our copper operations might be increased. New mica areas of the state could be producing. Our iron deposits have been profitably worked and are still a potential source for iron. Our lime deposits could be used to produce cement. Although our five pulp mills are running to capacity, our forests under proper control could furnish timber for another. Our chemical industries are now one of our principal financial manufacturing agencies, producing such necessary materials as fertilizers, pulp, paper, aluminum, bromine, leather, rayon, heavy and fine chemicals, edible oils and fats, and metals. We have all the opportunities for greatly increasing our part in manufacturing necessary chemicals for war purposes. In addition to a proposed ordnance works we could be producing explosives. We have extensive coal deposits which can be worked and farm products can be increased.

Because of the freedom of private enterprise our sources of power have been well developed in this state so that we have available all power required for our industries and war needs and also extra power to take care of industries in other states through our super-power systems.

Some of our enterprising small plants and machine shops are sub-letting contracts of large companies to produce parts of machines necessary for war purposes. Careful study should be made that all of our facilities may be used to the best advantage at this time to hasten the winning of the war and the assuring of a reasonably early victory.

An Abnormally Large Chicken Liver. E. C. COCKE.

An abnormally large chicken liver was described. The liver was removed from a young Plymouth Rock pullet. The chicken weighed $3\frac{3}{4}$ pounds alive, the liver weighed $13\frac{1}{2}$ ounces, which was about five times the size of a normal chicken liver.

Pulling Strength of Nails of Different Size and Depth. J. B. DERIEUX.

Previous to the 19th Century, nails were made by hand in the households of England as an art and trade. The first nail-making machine was invented by an American in 1786.

The sizes of nails are designated in penny. The origin of the word "penny" as applied to the size of nails is not very well known. Some authorities believe it originated from the cost in English pence of a hundred of the nails, others believe that it originated from the weight in pennyweight of a hundred of the nails, and still others believe that the word "penny" is a change of the word "pun", which was used for the word "pound".

The lengths of nails increase $\frac{1}{2}$ of an inch for each increase in size, beginning with the 2-penny at one inch, up to the 10-penny, from which point it increases one inch for each of the next four sizes, 10, 20, 40, and 60, the 60 being 6 inches long. The diameter of the 2-penny is .072 inches and for the 60-penny is .263 inches. The number per pound is about 1,000 for the 2-penny and 10 for the 60-penny, or the weight per 1,000 nails is almost one pound for the 2-penny and 100 pounds for the 60-penny.

The study was made on common wire nails from size 2-penny to 60-penny inclusive. They were driven into medium green oak by increasing depths of $\frac{1}{2}$ of an inch, and pulled after each increase, until the entire length of the nail was imbedded. The pulling was done by a lever system, the force to pull the nails being computed from the force at the end of the lever and the lever arms. The maximum pulling strength of the 2-penny, which is one inch long, was about 200 pounds and that for the 60-penny was almost 4,000 pounds. The strength for each sized nail varied directly as the depth. The strength for the same depth, one inch, varied approximately as the diameter of the nails, and the area for a given depth varying as the diameter of the nails, the pulling strength thus varied as the area of contact.

Growth and Nutrition of the Peanut Plant. LELAND BURKHART.

Calcium is established as an indispensable nutrient throughout the growth of the peanut plant. Employing the sand culture technique, mineral nutrients other than calcium in the peanut kernel are relatively mobile and are readily reutilized. Foliar deficiency symptoms of calcium, potassium, magnesium, phosphate, nitrogen and boron, respectively, and associated foliar nutrient levels are established for the Virginia Bunch peanut plant. The phosphate concentration must be kept low in sand cultures to prevent injury. Foliar diagnosis of nutrient conditions in young field-grown plants with special reference to the calcium-potassium-magnesium relationship is of practical value. The peanut fruit develops in the soil and, therefore the chemical, physical, and biological conditions in soils have a special significance in directly affecting quality of peanut fruits with particular reference to the formation of inferior fruits or so-called "pops" by the large type peanut varieties. A new approach for determining the specific effects of calcium and potassium on fruit quality is described. The fruiting medium was isolated from the rooting medium. Calcium was found to be very beneficial and necessary in the fruiting medium for the production of good fruit, irrespective of the nature of the rooting medium. The unfavorable effect of potassium in the fruiting and rooting media was largely overcome by the accompaniment of calcium in the fruiting medium. The absorption and translocation of minerals from the fruiting medium by growing peanut fruits was exemplified by lithium intake and distribution in the plant. The interaction of the rooting medium on the quality of fruit formed in the fruiting medium is clearly demonstrated.

The Fauna of the Sand Beaches at Beaufort. A. S. PEARSE and G. W. WHARTON.

Marine sand beaches are not barren, shifting wastes, but teem with animal life. At Beaufort, besides various macroscopic molluscs, crustaceans, and other peculiarly adapted psammobionts, there are in each liter of inter-tidal sands about 400 nematodes, 300 copepods, 60 foraminiferans, 35 ostracods, and many other minute animals. When tides ebb, shore birds forage over beaches; when they flow, schools of little fishes come to get their share of the great food resources that are present in sandy shores.

(The complete paper is included in Ecological Monographs Vol. **12,** No. 2.)

A Study of the Role and Importance of Bacteria in Ocean Beaches at Beaufort, North Carolina. H. J. HUMM.

Ocean beaches contain many more bacteria per unit volume of sand than might be expected and these organisms play a much more important ecological role than is generally realized. Organic matter is continually washed up, decomposed by bacteria, and the minerals returned to the sea. A remarkable variety of physiological types of bacteria make up the beach population. Among these are agar, chitin, and cellulose digesters; nitrite and nitrate reducers, denitrifiers, and probably nitrifiers and nitrogen-fixers.

On the outer Ft. Macon beach at Beaufort, an average of all samples taken was 200,000 per gram of sand. At the low tide mark, the average was 34,000; at mid-tide, 110,000; at high tide or drift line, 486,000. Counts of agar-digesters ran from 200 to 15,000 per gram. These figures probably represent only from 70 to 90% of all saprophytic, aerobic bacteria which would form macroscopic colonies on the medium employed after 5 to 7 days' incubation. The highest count for one gram of sand, 2,250,000, was from a high tide sample.

(The complete paper is included in Ecological Monographs Vol. **12,** No. 2.)

Construction and Use of a Solar Heating Unit. L. B. RHODES.

An experimental Solar Heating Unit is constructed and installed in practical use for observing characteristics in operation under Raleigh weather conditions. Twenty-six (26) $\frac{3}{8}''$ copper tubes are soldered $1\frac{1}{2}''$ apart in equi-spaced holes in two (2) 1″ brass pipes so that each 1″ pipe forms parallel headers. Heavy sheet copper strips are soldered the length between all the $\frac{3}{8}''$ tubes. The whole unit employs two such sections, all having a total area for direct sun's rays of 23.5 square feet.

With the headers of each section joined opposite and the sections in the same plane, the assembly is tilted 18 degrees from horizontal and toward the sun. The water supply enters the bottom header from a storage tank passing through all tubes to the top header and thence to the top of an inside 40 gal. tank. Natural convection produces continuous circulation of the water. All copper surfaces exposed to the sun's rays are black nickel plated and oiled which, it was discovered, increased efficiency of heat transfer.

The unit, which is located on the roof top, is enclosed in a cabinet heavily insulated with reflective surfaces. All pipes to the tank are heavily insulated with thick layers of cotton. The cabinet is covered by ordinary window glass. Underneath, electrical heating units are available for protection of the units from freezing, but are used only at temperatures around 6 degrees F.

The heated water passes from the tank into an electric water heater for distribution. The first tank, though uninsulated, holds its temperature with moderate loss overnight. The efficiency of the unit is about the same in winter as summer, usually heating 3 to 4 tanks, a rise of 60 to 65 degrees F. Highest temperature observed is 138 degrees F. of the tank on bright days. The equivalent in work of the energy collected, neglecting the daily heat loss from the tank per day of six (6) hours bright weather, is 12.7 to 14 K.W.H. or 381 K.W.H. upward per month which compares with 12 K.W.H., the average radiant energy available on an equal surface for six (6) hours at the average rate of 1.3 gram calories per sq. cm. per minute.

January, 1942, showed 79.1% bright days
February, " " 70 % " "
March, " " 75 % " "

October, 1941, to January, 1942, showed six (6) days too overcast for any useful radiation.

A More Detailed Study of the Meteorological Contrasts between Day and Night. CHAS. M. HECK.

To avoid the dampening effect of the large heat mass found in the standard U. S. Weather Bureau wooden shelter, an exact reproduction in size and shape was made in thin aluminum with double walls. This reduced the heat mass to one fifth and temperature changes in the atmosphere were recorded more exactly. However the maximum in the day was always higher in the aluminum shelter averaging about five degrees. More surprising was the unexplained phenomena of a higher minimum also. This averaged one degree. Since climatic records are made by averaging the maximum and minimum each day, Raleigh's climate would be recorded as three degrees warmer if the Weather Bureau used aluminum shelters of this type. Further the diurnal average change would be recorded as 23°F instead of 19°F. The arbitrariness of temperature recordings in wooden shelters is thus made evident and the need for more scientific standardization of atmospheric temperature records is indicated.

Using the same system of climatic recording, electrical records over a number of weeks in spring gave the diurnal maximal difference at the earth's surface on top of two dead leaves to be about three times that in the free air three feet above the leaves. This and other phenomena such as relative humidity, motion of the air, dew and frost were cited to indicate the great differences presented in worm's-eye-view meteorology from the meteorology that man records from his own standpoint.

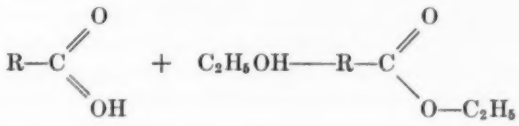
A Study of the Gross Physiological Reactions of Lower Organisms to the Antisulfonamide, para-amino-benzoic acid. E. M. LAVOR, F. F. FERGUSON and V. VAN ALDERMAN.

This is a generalized survey of the reactions of pathogenes, non-pathogenes, *Amoeba*, various ciliates and rotifers to aqueous solutions of the common sulfonamides and para-amino-benzoic acid and to combinations of the same. The work is outlined to: (1) ascertain the toxic and lethal effects of PAB and various sulfonamides upon laboratory cultured *Paramecium*; (2) find out if a non-toxic dilution of PAB nullifies the slightly toxic dilutions of a sulfonamide when used on *Paramecium*; and (3) inquire into the value of PAB as a growth promoting factor. Present findings: (1) using dilutions ranging from 0.09% to 0.01% of PAB *alone* we find that it is definitely toxic in dilutions *above* 0.02% and entirely lethal *above* 0.05% as used upon *Paramecium*; (2) using dilutions ranging from 0.8% to 0.08% of sulfanilamide *alone* we find that it is either toxic or lethal in its effect upon *Paramecium* in dilutions *above* 0.32%; (3) the slight degree to which PAB may act as an antisulfonamide in a combination with sulfanilamide is not in this case convincing; (4) at the onset in toxic effects of sulfanilamide upon *Paramecium* the weaker specimens succumb almost instantly, the others move slowly and swell appreciably, in higher concentrations producing pellicle papillae. A secondary effect is specimen immobility upon the substratum, later normal activity and appearance resumes for most; thus toxic effects do seem to be gradually thrown off.

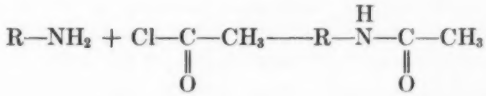
A Study of the Sulfonamide Inactivating Groups of Para-amino-benzoic Acid. V. VAN ALDERMAN, EDWARD M. LAVOR, and FREDERICK F. FERGUSON. (Read by title.)

We are attacking the problem of ascertaining the antisulfonamide group or groups in PAB by the following trial approaches:

1. Block off the carboxyl (acid) group by esterification.



2. Block off the amino (basic) group by acetylation:



The resulting compounds will be tested against various pathogenes, non-pathogenes and lower invertebrates for physiological reactions.

Variations in the Nature of Soil Colloids of North Carolina and their Relationship to Plant Growth. A. MEHLICH and F. M. MILAM.

The relationship of percentage base saturation and pH when measured over a wide range of reaction was found to be a specific expression of the nature of the base exchange mineral present in soil. These determinations are made rapidly since they are carried out with the natural soil. A large number of data pertaining to variations in the nature of colloids of North Carolina soils are being made available. This information is useful as an aid in the classification of soil particularly where the nature of the base exchange colloid plays a leading role in the mapping of soil types. It is important in problems of liming and fertility.

Results with peanuts for example have shown increasing hay yields by increasing the base saturation from 25 to 75 per cent when these plants were grown in sand culture containing an organic colloid. When peanuts were grown in a sand culture containing a kaolinitic colloid the yield of hay was about the same for 25, 50, and 75 per cent base saturation respectively. No peanuts were produced on a soil with less than 13 per cent base saturation and best yields were generally obtained on soils having 50 per cent or greater, base saturation.

The importance of percentage base saturation and nature of soil colloids on the absorption of mineral nutrients by tobacco has been shown. Calcium and potassium are usually absorbed more readily from the kaolinitic type of colloid than from the montmorillonitic or organic colloid.

The Enzymatic Decomposition of Quinine in Vitro and in Vivo. JAMES C. ANDREWS and CARL E. ANDERSON.

Lipkin, in 1919, suggested that quinine is enzymatically destroyed by the minced tissues of certain organs of the guinea-pig, rabbit, sheep, and ox. Using rats, we have confirmed this statement and have studied the distribution of the enzyme. We have also made some preliminary studies of the nature of this enzymatic reaction. Minced liver, kidney, brain and lung destroy quinine upon incubation with the latter for 24 hours at 40°C. The criterion of destruction of the quinine consisted in its apparent disappearance as estimated by the method of Kyker, Webb, and Andrews. The highest degree of activity was shown by minced liver. Attempts were therefore made to prepare a more concentrated enzyme preparation from fresh rat livers. By extraction of the minced tissue with 50% alcohol and precipitation at 70% of the same we have obtained a crude, active preparation of the enzyme.

The activity of the liver in the destruction of quinine was demonstrated *in vivo* as follows: The excretion of quinine by young adult rats after standard dosage was measured and found to vary between from 5 to 14% of that administered. After removal of from 30 to 50% of the liver the quinine excretion increased by 100 to 200% of the normal. After these rats were allowed to "regenerate" their livers the quinine recoveries fell to the normal range. On completion of the experiment and as a control against possible influence of operative shock, some of the rats were splenectomized and in others an abdominal incision was made. Quinine recoveries were again in the normal range.

This enzymatic conversion of the quinine lends support to the hypothesis that the effective anti-malarial agent is probably a metabolic product of quinine.

Further Notes on the Reactions of Certain Lower Organisms to the Common Sulfonamides. EDWARD M. LAVOR and FREDERICK F. FERGUSON.

The following information is furnished by this recent study:

1. Sulfaguanidine is not as uniform in its toxic action upon free-living microfauna as are sulfanilamide, sulfathiazole, and sulfapyridine.

2. While displaying a uniform lack of toxicity in *higher* concentrations, sulfaguanidine may at times show a definite toxicity in *lower* concentrations.

3. Toxic effects of sulfaguanidine do not appear uniformly as far as time is concerned.

4. *Mesostoma* sp. when exposed to sulfathiazole exhibits the expected toxic reactions plus an unusual increase in parenchymal pigmentation. This form is very susceptible to toxic effects of sulfanilamide.

Panicum Bennettense, a New Species from North Carolina. WALTER V. BROWN.

Three plants of this new species were collected at the Bennett Memorial, Durham, N. C. Although much like *P. angustifolium* Ell. it differs in the shorter spikelets, 2 mm., in the shape of the spikelet, elliptic, in the shorter first glume, $\frac{1}{4}$ the length of the spikelet, and in the longer ligule. It is obviously

closely related to *P. angustifolium* and belongs in the group Angustifolia. The type specimen has been deposited in the Duke University Herbarium.

Investigations of Control Measures for Granville Wilt of Tobacco. T. E. SMITH.

Experiments were started in 1935 to develop more effective control measures for Granville wilt (*Bacterium solanacearum* E. F. Smith) of tobacco. It has been shown that losses from wilt are considerably reduced by the growth of tobacco after three years of either corn, soybeans, or red top grass. However, crop rotation appears inadequate for ultimate control of this disease. Soil treatment with chloropicrin has given effective control but this is too expensive for use on large areas in the field. The combination of a corn rotation with urea treatment of the soil (1000 pounds per acre of Uramon) gave promising results. A high degree of genetic resistance was found in a collection of tobacco from Colombia, South America, and progress has been made by hybridization and selection toward the development of resistant varieties of flue-cured tobacco. When all phases of the work are considered, it seems that highly effective control measures are now in prospect.

A Discussion of Olpidiopsis and Pseudolpidium. ALMA J. WHIFFEN.

Though the genera Olpidiopsis and Pseudolpidium have been combined because a monospore culture of a species of Olpidiopsis produced both resting bodies with companion cells and resting bodies without companion cells, the question has remained as to whether or not there actually exist species of Olpidiopsis in which the resting bodies always lack companion cells as has been described. *Pseudolpidium gracile* on *Pythium rostratum* was studied and Butler's observation that this species lacks companion cells on the resting bodies is confirmed. *Aphanomyces cladogamous* was found to be parasitized by a species of Olpidiopsis, the resting bodies of which lack companion cells and which is recognized as *O. Aphanomycis* Cornu. Two new species of Olpidiopsis, both having companion cells on the resting bodies, are described as *O. curvispinosa* and *O. brevispinosa*. Both of these new species are parasites of Pythium. The conclusion is that in the genus Olpidiopsis there are species in which the resting body is constantly present on the resting body and species in which it is constantly lacking.

Osmotic Pressure and Diffusion Pressure Deficit Relations in Cotton Bolls. D. B. ANDERSON and THOMAS KERR.

Studies of the osmotic pressure and water-absorbing capacity of growing cotton seeds indicate that the force with which water enters the seeds may greatly exceed the osmotic pressure of the seeds. This fact is contrary to the widely held theory that water movements are determined as to direction by the relative diffusion pressures of the cells and suggests that energy is expended by the cells in the process of water absorption. The water-absorbing power of the carpel wall of cotton bolls of all ages invariably exceeded the osmotic pressure of the cells. In growing seeds the O. P. exceeded the water-absorbing power

when the seeds were young but fell below the water-absorbing power when the seeds were older than twenty-four days. The relative values of osmotic pressure and water absorbing capacity are indicated graphically.

Some Blue-green Algae Which Have Not Been Reported for North Carolina. ELTON C. COCKE and F. E. LEATHERWOOD.

Thirty-four species of blue-green algae new for North Carolina are reported and one species which is believed to be new to science. These algae were collected in the vicinity of Wake Forest and in Haywood County. The new species is tentatively placed in the genus *Dactylococcopsis* and given the new specific name *Poteatii* in honor of the late Dr. W. L. Poteat.

The Effect of Light Intensity on Photosynthesis in Pine and Oak Seedlings. PAUL J. KRAMER and JOHN P. DECKER.

The rate of photosynthesis of potted seedlings of loblolly pine (*Pinus taeda* L.) and eastern red oak (*Quercus borealis maxima* (Marsh) Ashe) were measured at seven light intensities ranging from 300 to 9300 foot candles. These intensities were obtained with Mazda reflector-type bulbs and various screens. The air temperature was maintained at 25° C. The apparent photosynthesis was measured in terms of absorption of carbon dioxide by the entire shoot. Maximum photosynthesis of oak seedlings occurred at about 3300 foot candles and photosynthesis decreased slightly at higher intensities. Photosynthesis of pine seedlings increased with light intensity up to the highest light intensity used, 9300 foot candles.

Some Additions to the Dicotyledonous Flora of South Carolina. BUDD E. SMITH.

Since 1932 I have been studying the flora of Darlington County, South Carolina. The county lies within the Coastal Plain except for the western edge which is in the lower Piedmont. The Great Pee Dee River forms the eastern boundary of the county, and in the southeast portion of the county two islands are surrounded by backwaters from the river. The river has its origin in the mountains of western North Carolina as the Yadkin River. The largest of the islands is called Witherspoon Island and a study of the plants found on the island has added many species to the flora of the state. One thousand and seventy-six (1076) species and varieties of dicotyledons have been identified for the county, and after checking all available literature and herbaria possible we find that the following 37 species are new to the flora of South Carolina:

Froelichia floridana
Gomphrena decumbens
Stellaria fontinalis
Portulaca pilosa
Rubus Baileyanus
Amelanchier stolonifera
Amelanchier arborea
Rhynchosia mollissima
Tephrosia Rugelii
Vaccinium liparius
Vaccinium holophyllus
Cochranea anchusaefolia
Lamium purpureum
Scutellaria Altamaha
Ilysanthes grandiflora
Pentstemon pallidus
Ruellia humilis
Ruellia hybrida

Tragia linearifolia
Chamaesyce Blodgettii
Chamaesyce hirsuta
Chamaesyce humistrata
Chamaesyce conferta
Euphorbia zinniiflora
Hypericum glomeratum
Isnardia spathulata
Lechea prismatica
Rhexia Nashii
Richardia brasiliensis
Diodia rigida
Sherardia arvensis
Melothria crassifolia
Specularia leptocarpa
Laciniaria Garberi
Tagetes minuta
Chrysopsis oligantha
Vernonia recurva

An Unusual Brown Iron Ore Deposit. J. W. HUDDLE.*

There is an unusual brown iron ore deposit in the southwestern portion of Cleburne County and the northwestern portion of Clay County southwest of Heflin, Alabama. These counties are in the Piedmont Plateau Province and are underlain by metamorphic rocks most of which were originally sedimentary. The ore occurs in the upper portion of the Talladega Series in a strongly sheared chloritic graphite schist. The deposits of proven or probable commercial value lie in a narrow zone along the south flank of a ridge held up by a quartzite member of the Talladega Series. The ore is not continuous in commercial quantities, but near the contact of the deeply weathered chloritic graphite schists and quartzites some ore was found for a distance of several miles. Much of the ore is low grade, but at several places the ore is high grade and occurs in large irregular bodies elongated in the direction of strike. It ranges in texture from solid to porous and massive to concretionary. Exposures of the ore body at the Chulafinnee Ore Company pit show the ore to replace the chloritic graphite schist. The Chulafinnee Ore Company mined over 130,000 short tons of ore from a body extending unbroken for about 1,800 feet with a thickness averaging about 30 feet. This ore averaged about 50% iron, .85% phosphorus, 4.0% aluminum, .60% manganese, 13.0% insolubles, 8.0% as received water. The largest deposit in the zone has not yet been extensively developed, largely because the phosphorus content exceeds 1%. This ore body is known to extend a half mile in unbroken deposit with a considerable thickness.

Nearly all the brown iron ore deposits of the Southern Appalachians are in residual clays derived from the weathering of iron bearing rocks. The ore occurs in pockets separated by extensive barren zones. The ore deposits here discussed are unusual in the great extent of unbroken deposits and in the fact that they are replacement rather than residual deposits. Some of the iron may have been derived from the hematite in the quartzites immediately adjacent to the chloritic graphite schists, and it is possible that the weathering of pyrite in other members of the Talladega Series may have supplied some iron. There is no indication that the deposit is a gossan. The concentration of the ore bodies seems to be best explained by cross-faulting, since the whole zone is strongly sheared. The deep weathering of the schists and quartzites is probably related to the formation of the ore, and it is possible that they were formed at the same time as the bauxite and primary kaolins of southeastern United States.

*Published with permission of Dr. Stewart J. Lloyd, Acting State Geologist, Alabama Geological Survey.

Reviewing North Carolina Coastal Plain Geology. HARRY T. DAVIS and HORACE G. RICHARDS.

For some two years now the North Carolina State Museum and the Academy of Natural Sciences of Philadelphia, have carried on cooperative studies, with field work, of eastern North Carolina.

Previous studies and publications were excellent, but necessarily incomplete in details. We would gather all studies for a more comprehensive coverage, possibly a new publication.

Our field work has added numerous fossil localities and new fossils from the Cretaceous to the Pleistocene. The most significant of the latter have come from the Castle Hayne (Eocene) and the Trent (Miocene). We are compiling records of the associated economic resources such as marl, phosphates, building stone, ilmenite, clays, water supply, etc., that are so important at this time.

We expect this survey to clarify many of the perplexing problems that students of this subject have pondered.

Economic Geology of the North Carolina Peridotites. T. G. MURDOCK.

North Carolina pegmatites have made an important contribution to the mining industry in the state. It is expected that the peridotites will make, in the future, a similar and even greater one. In North Carolina and Georgia more than 275 peridotite formations occur; many of them are dunites. A recent survey indicates that there are 20 olivine deposits containing an aggregate of at least 230,000,000 tons of material averaging 48.07% magnesia. Olivine deposits are of the dunite and saxonite types. Structurally the intrusives occur as lenses and ring dikes. Olivine production to date has been on a small scale, principally for refractory use; a plant at Webster has produced magnesium sulphate. Research is being conducted toward utilization of olivine as a source of magnesium, but prior work, and other factors, have led to more consideration being given to other sources, particularly sea water. Vermiculite has been produced from several peridotite areas; a small industry has been developed in Macon and Buncombe counties. This unique group of minerals is finding an important place as a light-weight insulating material. Chromite occurs at several localities, usually in small quantities; but it does have an economic importance and placer mining was carried out at Democrat in 1941. Nickel-bearing minerals occur at several localities. Anthophyllite occurs in many of the dunites and production has been reported from Avery County. Further geological studies will obtain much useful information regarding these most interesting formations and eventually lead to a wider development.

The Geomagnetic Disturbance of August 4, 1941, as Observed in North Carolina and in Oregon. G. R. MACCARTHY.

During the mild "magnetic storm" of August 4, 1941, identical magnetometers were being operated at Johnson Creek, Oregon, and at Webster, North Carolina. Although these localities are approximately 37° 7′ apart in longitude, and in regions which are geologically quite different, there is very little difference in the records made at the two stations. In each case the vertical

component of the earth's magnetic field increased at a nearly constant rate during the period of observation, the rate being 17 gammas per hour at Webster, and 16 gammas per hour at Johnson Creek.

Geology of Three Wells in the Coastal Plain of North Carolina. WILLARD BERRY.

The need for potable water in the several defense areas in eastern North Carolina caused an increase in drilling in that area. Mr. M. J. Mundorff of the United States Geological Survey in cooperation with the State Geological Survey collected samples from these wells. Three of the wells in a more or less east west line have been examined in detail.

The Lane Housing Project well was drilled west of Jacksonville, Onslow County, and is the farthest west. The Rural Electrification Administration well is on the east side of the Northeast Creek at the R. E. A. power station on N. C. Route 24, Onslow County. Cherry Point #2 well is at the Marine Base at Cherry Point on the Neuse River in Craven County and is the farthest east of the three.

The section encountered in the Lane Housing Project well is Pleistocene 0–34 feet, Pliocene 34–47 feet, and Miocene from there to bottom, that from 109 to 132 is probably Trent Marl. The R. E. A. well section would seem to be Pleistocene 0 to 58 feet, Pliocene 58 to 88 feet, Miocene 88 to 257 feet (possibly Duplin), and 257 to 327 (probably Trent Marl). Below 327 probably Eocene and still in Eocene at 566 feet. Minor breaks between 367 and 388, 391 and 395, 403 and 445, and 445 and 566. This well drilled to 588 and ended with salt water but last sample is labeled 566. Cherry Point well #2, Pleistocene 0–35 feet, Pleiocene 35–70 feet and Miocene 70 to 140 feet which is probably Trent Marl. These wells lack definite evidence as to exact correlation. Fossils are very scarce and samples quite irregular in quantity and spacing. Mechanical analysis, calcium carbonate determinations, and heavy mineral have all been considered, as well as the lithology and fossils.

Results Obtainable with the Cenco-Concave Grating Spectrograph. J. B. DERIEUX.

The concave grating spectrograph has a focal length of 106 centimeters, a dispersive power of about 16 angstroms per millimeter, and a resolving power of 15,000. With the fine slit, the lines are very sharp and the sodium double lines are separated about $\frac{1}{3}$ of a millimeter and therefore the wave lengths may be determined to one angstrom or less.

The spectrum plates are 5 centimeters wide and 25 centimeters long. Seven exposures of about 5 millimeters each may be made on one plate, or 14 exposures with 2 millimeters.

Plates of spectra were shown projected so that the audience could see the sharpness and separation of the lines.

Experimental Evidence for Functional Autonomy of Motives. DOROTHY RETHLINGSHAFER.

The present experimental evidence for Allport's use of the principle of functional autonomy of motives seems inadequate as supporting the systematic and

long-lasting activities of human adults. An examination of the studies cited by Allport, and related work, would indicate that the techniques used are suggestive of how an approach may be made to the problems inherent in human motives, but as yet permit no conclusions in regard to the principle of functional autonomy applied to these motives. Certain experimental methods used in these studies are reviewed.

Effects of Organization upon the Remembering of Meaningful Material. CLYDE MONTGOMERY and KARL ZENER.

Traditionally the memory of meaningful material has been approached indirectly by inferences primarily from results obtained through the recall of nonsense items. Recently more direct attempts have been made to investigate the memory of meaningful verbal material as a function of its specific content and organization rather than merely in terms of its degree of meaningfulness. The present experiment investigates in a fashion more controlled than hitherto the factor of essentiality, or relevance, to the structure of a story.

Ten items were differentially embedded in two stories in such a way that five were essential to the plot of one story but irrelevant to that of the second, and the reverse. The stories were given to 12 groups of sixth and seventh grade pupils totalling nearly three hundred students. Reproductions were obtained after three time intervals—15 minutes, 24 hours, and 7 days. Each group was given only one story and was asked for only one reproduction.

This procedure made possible comparison of the recall of objectively identical items when they were and were not essential to the structure of the story in which they occurred. At all recall intervals the items were remembered better when they were essential than non-essential, the average recall being respectively 45 and 26 per cent. The relative advantage of the essential items increased with the recall interval. The differential effect showed in the recall of the details as well as in the main points of the statements and was strongest in the less well recalled. Finally the appearance, in the reproduction, of supplementary items not present in the original story was markedly affected by the factor of essentiality. Ninety-five per cent of such additions in the recall were qualifications of or related to essential items.

Some Experimental Problems in Military Psychology. A. G. BAYROFF.

The experimental psychologist will discover many interesting problems in connection with aviation. Some of these are: What factors are involved in visual acuity which are not involved in perception of figure-ground relations? What is the effect of the nature of the object on the perception of its movement? Can people be trained to increase the ease of their perceptions of form, movement, etc.? What are the factors that determine the perception of visual stimuli of brief duration? Is it necessary to include mental hygiene in the training of a student pilot so that he can learn to control his automatic compensatory movements? Is it necessary to direct the student's attention to every detail of his movements? What factors are responsible for the disintegration of the

motor coordinations in flying? Many more problems suggest themselves, and the experimental psychologist can not only make a contribution to the carrying on of the war but will also contribute to the solution of many psychological problems.

A Study of the Cytology of Toxocara cati Brumpt. C. M. ALLEN.

The taxonomic history of the common cat ascaris, *Toxocara cati*, is long and confused. It is frequently impossible to tell from the literature whether work has been done on *T. cati* or the dog ascaris, *T. canis*. The present paper is an account of an investigation on both the male and the female and in both the mitotic and meiotic cycles of this common parasite. The classifications of Yorke and Maplestone and of Faust were used. All methods were routine except that Delafield's haematoxylin was substituted in the Haidenhain schedule to secure greater contrast between vitellus and chromatin material in mature eggs.

Near the upper end of the testis cells are found passing through a period of rapid multiplication. In the metaphase plate there are nine chromosomes one of which is considerably larger than any of the others, measuring approximately 1.2 microns in length. Near the middle of the testis cells which have gone through a resting stage can be found. Here the largest chromosome measures 2.5–2.7 microns in length. Near the lower end of the testis cells whose nuclei exhibit meiosis can be found. Synapsis takes place in the prophase preceding the heterotypic division. The final division into functional germ cells or spermatids usually consists of a lateral constriction of the nucleus giving two end product cells with the reduced number of univalent chromosomes. Half the functional spermatids contain four chromosomes and the other half contain five of which one is the large unpaired element.

After the last division resulting in the reduced number of chromosomes the sperm nuclei return to the resting condition, in which stage they remain until after the eggs of the female have been penetrated and the fertilization figures produced. By the time the sperms have been extruded from the ductus ejaculatoris the amount of cytoplasm has been greatly reduced. After transference to the vulva of the female the sperms assume rather irregular shapes and seem to crawl up the uterus to the seminal receptacle in an amoeboid fashion. Actual penetration of the egg occurs as it is entering the upper end of the uterus. From this time until actual fertilization occurs, the sperm appears in the egg as an elongated, arrow-head-shaped body with an elliptical central apparatus consisting mainly of a large number of peripherally arranged chondriosomes.

Near the upper end of the ovary cells in mitotic division can be found. The nuclei average 5.5 microns in diameter and contain nine chromosomes one of which is a great deal larger than any of the others and seems to be of a double nature. By the time the egg has entered the uterus considerable vitellus has been added and after the sperm penetrates the egg the egg wall becomes thickened and shell-like. Fully formed eggs attain a size of 60–65 microns with shell 2.5–3 microns thick. The nuclei of these cells represent the primary oöcytes

and their metaphases show eight chromosomes, four globular and four rod-shaped, in addition to the large element which at this stage appears to be clearly of a double nature.

Synapsis takes place in the prophase preceding the first maturation division. After synapsis two divisions occur which bring about the reduced number of chromosomes in the resulting oötids. A split in the paired homologs produces tetrad figures. Actual reduction between homologous chromosomes takes place in the first or heterotypic division; the second or homotypic division merely separates elements of dyads.

The spindle of the heterotypic division is set at an angle to the wall of the egg and one group of dyads remains near the end of the spindle, forming the secondary oöcyte while the other moves close to the edge of the egg to become the first polocyte. Both the secondary oöcyte and the first polocyte now pass through a homotypic division in which the elements of the dyads are separated. Both the heterotypic and homotypic divisions take place rather rapidly and no definite vesicular nucleus is formed between them.

All of the functional oötids possess five chromosomes, one of which is much larger than the rest and homologous with the large chromosome found in half the functional spermatids. This is the sex chromosome and sex determination is of the XX-XO type of male digamety.

The Respiratory Mechanism in Turtles. F. H. McCUTCHEON.

The diamond-back terrapin (*Malaclemys centrata*) was studied in an attempt to clarify various conflicting explanations of turtle respiration. Recordings, measurements, and observations of the factors involved in breathing show the following:

a) The valvate musculature of the glottis is so regulated that the glottis is closed except during expiration and inspiration. The intra-pulmonary pressure is, therefore, independent of atmospheric pressure, and records show transient pressures as high as +18.0 mm. Hg. It usually varied between +2.0 and +4.0 mm. during intervals between breathing cycles (apnea).

b) The breathing cycle consists of expiration, inspiration, and compression, followed by a variable period of apnea. For one 654.0 gr. female specimen observed at rest with the temperature 29°C., a frequency of 3.7 cycles a minute was average. From one to four or more cycles in series occurred with two consecutive cycles most common. The period of apnea for 108 cycles varied from 22 sec. to 46 sec. with an average of 31 sec. Larger variations in apnea were frequently recorded, sometimes lasting from 5 to 7 minutes when the specimen is entirely undisturbed.

c) Normal, quiet breathing is accomplished by two sets of muscular diaphragms which act antagonistically. The expiratory set consists of the transverse abdominis and the diaphragmaticus which practically enclose the viscera. They compress the lungs when contracted. The inspiratory set includes the serratus magnus which extends across the anterior leg pocket in the shell and the oblique abdominis which is similarly located at the posterior flank.

Most of the resting displacement of air and inspiratory activity is the result of movement of the posterior diaphragm. Forced breathing (dyspnea) involves increased amplitude of the oblique abdominis, more active movement of the serratus magnus, and, under some conditions, movement of the pectoral girdle and neck. Also the period of apnea is reduced or may be eliminated.

d) Records of throat movements indicate that they are associated primarily with olfaction. The studies of intra-pulmonary pressure and determination of the fact that the glottis is normally closed during apnea preclude any frog-like breathing function of the throat movements. This has been a major source of disagreement in the explanations of turtle breathing.

Similar conclusions were reached for the box turtle, mud turtle, snapping turtle, and loggerhead turtle.

Anatomy and Taxonomy of Two Species of the New Genus Pregermarium (Turbellaria, Alloeocoela) from the Beaufort (N. C.) Biological Station. MARGARET A. STIREWALT, F. F. FERGUSON, and W. A. KEPNER.

Pregermarium is a genus, belonging to the Cylindrostominae, that is protogynous. The ovary lies anterior to the cephalic ganglia. *Pregermarium beaufortense* and *P. carolinense* differ in that the former lacks bands of black pigment in the dorso-anterior region of the pseudocoele; its walls of pharynx and penis are stouter and its vasa differentia more slender. A posterior group of unicellular glands in each species suggests the byssus gland of certain molluscs. The implantation of a mass of spermatozoa into the epidermis of one specimen of *P. beaufortensis* by another is recorded. Chromosome number for each species is: x = 4, 2x = 8.

Notes on the Turbellarian Fauna of Rochester (N. Y.). Anatomy of Macrostomum ontarioense n. sp. F. F. FERGUSON.

Notes on the ecology and varieties of Turbellaria of Monroe County, N. Y., with special reference to the anatomy of *Macrostomum ontarioensis* n. sp.

Forage Utilization by the White-Tailed Deer of the Appalachian Region. E. A. SCHILLING.

Ecological studies were initiated on the Pisgah National Game Preserve eleven years ago for the purpose of determining the relationship of the deer to the environment. More specifically the studies were designed to determine what plants were eaten by deer and the relative palatability of the various species eaten. The stomach contents of many deer taken throughout the different seasons were analyzed and the findings were correlated with data obtained by charting of line quadrats in the various vegetative types. The following major types in order of total acreages involved were studied and classified from the standpoint of deer food value: oak-chestnut, cove hardwoods, yellow pine-hardwoods, northern hardwoods, fields, spruce balsam, lake, and barren. One hundred eighty-seven species of plants were found to be important as deer food. Only 40 of these were eaten in winter and only 16 of these 40 were considered

as important winter deer foods. Four species comprised 80 per cent of winter deer food. Important timber trees browsed extensively by deer during the reproduction stage are yellow poplar, basswood, white oak, red oak, maple, white ash and magnolia. Abnormally high deer populations can seriously damage forest vegetation. The solution seems to lie in keeping the deer herd within the carrying capacity of the range.

Thirty Million Acres of Undiscovered Wildlife-Land in the U. S. A. VERNE E. DAVISON.

Thirty million acres of agricultural land, unsuited for crops, range or timber, await a new classification. A new term "wildlife-land," is needed to designate these small bits of land which are intermingled with cropland and pasture, but not used for either purpose. Lands useful for wildlife and nothing else include such areas as steeply sloping stream banks, rock outcrops, field and woodland borders, ill-drained bottom lands, thick brush and scrub, swamp and marshlands, ponds and lakes. If such areas are frankly recognized as best suited for the production of wildlife and not forced into treatments where labor and money will only be wasted by misuse, farmers, wildlife and the nation generally will be the gainers.

A Program for the Management of North Carolina's Inland Fisheries. WILLIS KING.

The attention of the conservation minded public has quickly shifted from wildlife to winning the war. In order to retain the foundation of our conservation structure, it is as important that our resources be properly conserved in time of war as it is in time of peace. The attention given North Carolina's varied aquatic resources has in many instances been inadequate to conserve the aquatic life and perpetuate good fishing. Protection is recognized as one of the most important features of the fisheries program, and at least a third of the available revenue goes for this purpose.

Research activities are principally surveys of the streams in the western part of the state to determine their capacity for carrying trout and other game fish. This program, although begun in 1941, has enabled a better use of the fish produced at the state hatcheries, and has shown the need for modifying stocking procedures and the improvement of fish habitats. Special problems which await study include a survey of the waters of the Coastal Plain. This will require the development of new techniques. Water is being impounded by both private and public agencies at a rate faster than the state is able to provide fish for stocking the new ponds and lakes.

Another third of the available fisheries funds are being spent on fish hatchery maintenance and operation. The state's trout hatcheries are considered fairly adequate, but the facilities for rearing warm-water fish are insufficient. The development of new water areas promises to be the best means of increasing the available public fishing areas. An additional source of revenue beyond that obtained from the sale of fishing licenses and permits must be obtained before

the present program can be expanded. Legislation will be needed on this point, as well as to enable control of pollution which is severe in many portions of the state.

Even though the war may delay the achievement of many objectives, the need for providing increased sport and recreation is certain to arise when conditions again become normal.

The Accomplishments of the North Carolina Cooperative Farm Game Program Since 1937. JAMES C. DARSIE.

The North Carolina Cooperative Farm Game Program was initiated in July 1937 with a field biologist stationed in each of six districts in the state. Since that time 1273 agreements have been entered into with cooperating landowners in 85 counties. One hundred and twenty-six agreements have been cancelled. While the program is designed to improve the status of the wildlife resources in general, it gives most attention to the game species. Based on two long-range principles of providing a satisfactory environment and regulating the kill so as to conserve sufficient breeding stock, the program is essentially one of educational demonstrations. From the standpoint of individual cooperators, the program frequently has not come up to expectations, but from the standpoint of getting people fundamentally interested in wildlife conservation, it has been fairly successful. A main problem involves keeping up the interest of the cooperators. Many farmers object to posting their land because of fear of offending neighbors. Hunting allowed on cooperating areas has been on the conservative side. Compliance with regulations concerning stray cats and free hunting dogs has been fairly satisfactory. Much hard work remains to be done but many people interested in game are becoming conservation minded through this program.

Research Dealing with North Carolina Fur-Bearing Animals. JOE C. RABB.

Studies are underway to determine the present status of important furbearers in North Carolina. Records of fur dealers have been analyzed in detail, whenever available. Considering the state as a whole, the muskrat makes up 36% of the total catch, raccoon 24%, opossum 23%, mink 8%, with grey fox, red fox, weasel, skunk, and wildcat making up the remainder. These percentages vary over the four natural districts studied; the Mountain, the Piedmont, the Northern Coastal Plains, the Southern Coastal Plains.

Under the present system of reporting sales of raw furs it is difficult to arrive at a figure representing the total catch, since furs may change hands as many as five times within the state, before reaching the manufacturer.

Research now underway is directed toward acquiring information on the best season for trapping, so as to insure primeness of the pelt and not to encroach on the animal's breeding season. Collection of ecological and life history data are part of the study. Also experiments aimed toward the improvement of marsh for muskrat habitat are being carried out.

Zoological Factors in Deer Research. SETH GORDON, JR.

The research involved in a state-wide study of white-tailed deer shows the close relation between pure and applied zoology. Pen-held animals are satisfactory for study of certain problems, particularly diseases, but may fail to bring out basic ecological and life history factors. Determination of sex ratios is necessary to learn whether the females are in a productive state, and if both sexes or one should be taken by hunters. To determine percentage of does with young, a modified Ascheim-Zondek test has been used with some success.

Using wild trapped animals and those killed by hunters, weights and measurements have been made on 700 deer in North Carolina. The difficulties encountered in handling wild deer have been partially removed by experiments employing injections of barbiturates. Hypnotics of this nature prevent shock to the animals, which frequently occurs in handling live deer.

Examination of wild deer indicates a higher degree of disease and parasitism than the public usually supposes exists. Diseases borne by the deer which are transmissible to man include anthrax, contagious abortion, tuberculosis, rabies, foot and mouth disease. Diseases and parasites normally associated with domestic animals but which attack deer include necrotic stomatitis, foot and mouth disease, cattle fever tick, rabies, encephalitis, tuberculosis, and various parasitic worms.

It will be necessary to solve several basic problems in nutrition before obtaining a complete picture of the ecology and natural history of the whitetail.

The Mourning Dove in North Carolina. MARK H. TAYLOR.

Four study areas ranging from 1550 acres to 8000 acres in size were established, one each in the Coastal Plain, Lower Piedmont, Western Piedmont, and Mountain Region for the purpose of determining nesting and breeding habits, migration habits, and densities and fluctuations of mourning doves in North Carolina. The study of the nesting and breeding habits received most attention during 1940, the year covered in this paper. Three hundred functional nests were studied on the four areas and April, May, June, July, and August were found to be the important nesting months. Field data revealed the peak of nesting activities in all except the Lower Piedmont study area to be in May, while the peak was reached in June on the area near Raleigh, North Carolina. Study should be carried through more nesting seasons. One hundred and fifty-one or 50.3 per cent of the 300 nesting attempts were unsuccessful, with higher losses during the early part of the nesting season. This may have been due in part at least to lack of foliage and poorly constructed type of nest built by doves.

Measurements of length and width of male dove gonads revealed a direct correlation of gonad size with nesting intensity.

PROCEEDINGS OF THE ELISHA MITCHELL SCIENTIFIC SOCIETY

OCTOBER 14, 1941, TO MAY 12, 1942

410TH MEETING, OCTOBER 14, 1941

F. K. CAMERON: *Recent Progress in Whole Cotton Investigation.*
W. L. ENGELS: *Ocracoke Island and its Vertebrate Fauna.*

411TH MEETING, NOVEMBER 11, 1941

R. B. LAWSON: *Structure and Clinical Use of Vitamin K.*
S. E. SMITH: *Sorption by Polymer Films.*

412TH MEETING, DECEMBER 9, 1941

D. F. MILAM: *A Nutritional Study of a North Carolina Community.*
E. P. COOPER: *The Nature of Cosmic Rays.*

413TH MEETING, JANUARY 13, 1942

STERLING BRACKETT: *Epidemiology of a Schistosome Dermatitis.*
H. B. GOTAAS: *The Time Factor in Chlorine and Chloramine Disinfection of Swimming Pools.*

414TH MEETING, FEBRUARY 10, 1942

E. S. ADDISON: *Problems of Naval Gunnery.*
NATHAN ROSEN: *What is Gravitation?*

415TH MEETING, MARCH 10, 1942

E. H. NEWCOMER: *The Use of Colchicine in the Production of Better Plants.*
D. E. COPELAND: *Cytology of the Triturus (Salamander) Pituitary.*

416TH MEETING, APRIL 14, 1942

J. L. COE: *Methods of Study in North Carolina Archaeology.*
W. A. RICE: *Huronian Sediments in Ontario.*

417TH MEETING, MAY 12, 1942

F. N. LOW: *Some General Features of the Cerebral Cortex.*
H. C. MASON: *Standardization of Streak and Fixed Virus.*

The following officers were elected for the year 1942–43:

President—M. J. Rosenau.
Vice-President—J. E. Adams.
Secretary-Treasurer—R. J. Wherry.

THE INTERPRETATION OF THE DEVELOPMENT OF THE HYPOPHYSIS (PITUITARY BODY)

By B. F. Kingsbury[1]

As, in the process of reasoning the premises determine the conclusion, so in biology and in science generally the assumptions serving consciously or unconsciously as a basic approach largely determine the conclusions reached. The development of an individual organism resolves itself into Growth and a change in the character of growth, or Differentiation. The nature of the processes which lie back of these and the factors, intrinsic or extrinsic, that determine them are the fundamental aspects of the problem which development presents. The concept of the body as an aggregation of distinct and distinctive organs frequently engenders an illogical approach. The greater the interest in any specific organ, the more marked is apt to be the shift in emphasis. Thus, the intense interest which centers in the distinctive metabolic effects which that unique structure the hypophysis exhibits, has been responsible for an undue emphasis upon the adult mammalian structure in the interpretation of its development. This has led to a reversion,—indeed, a perversion,—of the logical sequence in developmental interpretation. The well-known morphology of the hypophysis in a typical mammal with its four regions and cavity, the "residual lumen", is correlated with the usual view that Rathke's pouch as an up-pocketing of the primitive mouth cavity meets an out-pocketing of the neural tube and thus establishes the customary morphological relation of the adult[2]. That such a statement is incorrect has been several times emphasized (Cf. Gilbert, 1934; Kingsbury and Roemer, 1940). A cursory survey of the early development of the head suffices to reveal that Rathke's pouch as such is but the mechanical expression of a complex of developmental growth factors. These in turn are clearly responsible for the existence of the morphological parts typically recognized in the mammalian hypophysis. The recent recognition (e.g., Wislocki and Geiling, 1936) that a Pars Intermedia or a Pars Tuberalis is lacking in the adult of certain mammals is thus not as disturbing as might seem. Considering only the Pars Intermedia, it is clear that its presence as a subdivision of the hypophysis rests primarily upon (a) the presence of the residual lumen and (b) a close association with the Pars Nervosa. When these are lacking a pars intermedia as a morphological entity does not exist. A slight variant in the growth could produce the different morphology. The comment of Van Dyke (1939, p. 10) that: "The embryonic development of the organ in the

[1] The writer wishes to acknowledge the many courtesies extended by Dr. W. C. George and staff of the Department of Anatomy, including free use of all facilities of the laboratory and of the library.

[2] The most recent as well as most extreme illustration of this is found in a comment upon the presence at birth of a cranio-pharyngeal canal in a hybrid dog. "The posterior segment of the basisphenoid, which contains the sella turcica on its surface, shows a large opening which represents an arrest in the closure of the opening, Rathke's pouch, through which the hypophysis grows from the stomodaeum up into the cranium."

porpoise is therefore apparently different from that in other mammals," is thus hardly justified. The uniformity of the morphogenetic pattern in mammals does not suggest any fundamental difference in these particular instances. The primary transformation is that the superficial ectoderm immediately bordering the neural plate anteriorly, in the great expansion of the prechordal neural tube, becomes the hypophyseal area anterior to the pharyngeal membrane (oral plate). This ectoderm is primarily or secondarily in direct and intimate contact with the floor of the forebrain and tends to maintain this relation despite the intrusion and growth of mesoderm elsewhere. This is an essential feature of the morphogenesis as determining the presence of a Pars Intermedia. A more extensive early intrusion of mesoderm would determine its absence and establish the peculiar relation reported (among other vertebrates) in the whales and the porpoises. The embryology of these mammals is unknown, but the development of the hypophysis of the armadillo, another 'atypical' form, has been partially established (Oldham, 1941).

As has been indicated, Rathke's pouch, as such, is the mechanical expression of the great expansion and rotation of the forebrain, together with the intrusion and growth of the mesoderm. These, together with a certain grade of intrinsic growth, transform the ectoderm of the hypophyseal area into a pocket. The source and growth of the mesoderm (Cf. Adelmann, 1932) is such that an intrusion to separate the hypophyseal plate (or Rathke's pouch) from neural plate (forebrain vesicle) is in the typical mammal late, slight or often in part lacking. The presence of a cavity within the growth-folded ectoderm, remaining in the typical mammal as the "residual lumen," is also a mechanical expression of the mode of growth,—of negative character and of no intrinsic significance.

Both the vesicular character of the forebrain and the time of appearance and growth-expansion of the mesoderm are subject to marked variation within the vertebrate phylum. Hence the correlated morphology of the hypophysis is likewise subject to an equally extreme variation. In terms of early vesicular expansion of the forebrain, the different classes and orders of the vertebrates may be roughly arranged in two groups, as follows: Group I: Elasmobranchs (Selachians, Plagiostomes), Mammals, Reptiles, Birds, Myxinoids (Cyclostomes), Apoda (Caecilia) Crossopterygians (?). Group II: Crossopterygians (?), Lamprey (Cyclostomes), Dipnoans, Ganoids, Caudate and Anuran Amphibia, Teleosts. Only in the first four of group I is a typical Rathke's pouch found and only in the first two is the residual lumen usually persistent or typical. No Rathke's pouch exists in group II although in a number of classes a cavity comparable to the residual lumen may appear secondarily.

In elasmobranchs the characteristic and highly vesicular expansion of the brain, together with the correlated development of the hypophysis, is well known through the comprehensive works of Baumgartner (1915), de Beer (1926) and Woerdemann (1914). Norris (1941) has recently correlated knowledge of the elasmobranch hypophysis and has further given, with full illustration, an important and systematic presentation of the morphology of the structure in the entire class. Figures of earlier stages of the morphogenesis in the shark were

presented by the writer (Kingsbury, 1922, figs. 17–26). The hypophyseal plate is in contact with the floor of the forebrain from optic chiasma to infundibular recess. Its "folding off" by the growth of the mesoderm is peculiar in that it occurs at both its anterior and posterior ends, producing a capacious sack which is finally cut off from the superficial ectoderm. This 'double evagination' in the elasmobranchs led naturally to distinctive interpretations by the four investigators mentioned above.

Recognizing three characteristic lobes in the growth of the hypophyseal sack, —namely the anterior, inferior (ventral) and superior (intermediate) lobes, Baumgartner (1915) states that: "Rathke's pouch forms the posterior part of the anterior lobe. The later evagination of the ectoderm anterior to this forms the middle portion and the anterior extremity of the anterior lobe. . . .The inferior lobes develop from the lateral sides of the posterior extremity of the anterior lobe, i.e., from the Rathke's pouch. The superior lobe is from the caudal (superior) end of the hypophyseal anlage [i.e., from Rathke's pouch]". de Beer (1926) comments (p. 70):—"The maxillary processes in their development push the skin away from the brain and the folds so formed lap over Rathke's pocket (Fig. 88). Eventually when the folds have met beneath it and fused, the hypophyseal cavity is closed off, but it consists of more than the original invagination of Rathke's pocket. As in the pig and the lizard and presumably all Amniotes a portion of the outside world is nipped in in the closing of the hypophyseal cavity." Woerdemann (1914) recognized in elasmobranchs an original caudal evagination, Rathke's pouch. Later, anterior to this another evagination occurs, while an oral cavity space between these is included within the hypophyseal sack which thus is composed of an "anterior space", a "middle space," and Rathke's pouch. From Rathke's pouch he derives the superior lobes. The anterior lobes represent the anterior and middle spaces, while from the latter the ventral lobe(s) out-pocket. Norris (1941) considers it sufficient to state (p. 38) that "The plagiostome hypophysis cerebri is a derivation of Rathke's pouch and the immediate environment of the latter." However, two pertinent figures (figs. 20, 21) are presented and in the description of the first of these he says: "This figure confirms the statement of Baumgartner and shows that the anterior part of the anterior lobe originates not from Rathke's pouch proper, but from an independent fold in the ectoderm anterior to and distinct from Rathke's pouch."

It is evident that the customary conception of the development of the hypophysis is hardly applicable in the elasmobranch where an apparently different mode of formation has been well established, determining an equally distinctive and complex morphology, not to be directly compared[3] with the relatively simple type of the typical mammal. The comparison has, of course, been attempted (Cf. Norris, p. 10). Woerdemann (1914) believed that the same tripartite hy-

[3] (Norris, 1941, p. 38.) "The plagiostome [elasmobranch] hypophysis has no exact detailed homologue in other vertebrates. The lobes of the hypophysis, however varied in size, shape or situation, or in attachments and other relations to brain, saccus vasculosus and cranial walls, always conform to the definite plagiostome hypophysial type. The type is never obscured."

pophyseal origin which he found in the elasmobranch was also encountered in reptiles, birds, and mammals. However, the anterior space and the middle space are of progressively lesser relative extent in these three classes. The quotation from de Beer (1926) previously given similarly presents the same interpretation. There is of course a factual basis upon which the interpretation rests. The fallacy in logic lies in giving individuality and a name to a variant expression of a growth transformation and making this in turn a basis for homology. Thus, in all three of these classes alike, the hypophyseal ectoderm is in contact with the floor of the forebrain from chiasmatic ridge to the infundibular recess. The early expansion, rotation and bending of the brain, together with the growth of the mesoderm, effect the folding off as an hypophyseal vesicle or sack. If the mesoderm early appears anteriorly and expands[4] without markedly intruding between hypophyseal plate and the neural tube, an anterior pocket is established in addition to an earlier caudal pocket (i.e., Rathke's pouch). This has been shown to be particularly marked in the elasmobranch. It is clear in the lizard and snake among reptiles, but—in the opinion of the writer—questionable in birds. The anterior pocketing doubtless occurs in some mammals but it is certainly not obvious in others. There is no justification for giving the term 'Rathke's pouch' other than a descriptive connotation.

The forebrain in the animals of group I expands not only rostrally but bilaterally, the evagination of the optic vesicles early determining this aspect. It may be expected that the hypophyseal expansion shares in the bilaterality of growth and that variants in the degree or early expression will now and then be encountered. Such indeed is the case. Lateral expansion as the "lateral lobes" generally appears relatively late. However, it may occur early and take the form of separate and lateral 'evaginations',—as in certain lizards (Gaupp, 1893) and mammals (Chiarugi, 1894; Weber, 1898) and in the Apodan, Hypogeophrys (Laubmann, 1926). The last form will be referred to subsequently.

As was earlier stated, the cavity of the hypophyseal sack has no intrinsic significance; it is merely an expression of the mechanics of development. It is therefore not surprising that the residual lumen, as far as is known, becomes lost in birds (Rahn and Painter, 1941) and probably in most reptiles. As was earlier commented, this seems also true of certain mammals; at least it is not present in the adult. Even in the elasmobranchs, in which the hypophysis develops as an extensive sack, the residual lumen may become lost. Norris (p. 38) states that: "In the batoid type the entire hypophysis [pars buccalis] is solid, except for occasional vestigial persistencies of the residual cavity."

Finally, there are two unique vertebrate forms which have been included within group I, since the forebrain is formed and expands as a hollow vesicle and the hypophysis arises as a hollow sack. In the first of these, the myxinoid fishes, the hypophysis is an extensive sack resembling superficially that of the

[4] Haller (1924) and more specifically Haller and Mori (1925) who compare the hypophyseal development in elasmobranchs, reptiles, and mammals, consider that a variation in the anterior (rostral) growth of the Maxillary Processes determines the different morphology. The present writer prefers to homologize less sharply the mesoderm involved.

elasmobranch. However the cavity, from the beginning, is in free communication with the exterior in conjunction with the "monorhinic" nasal sack. As in the case of the elasmobranch, it is not to be readily and fully homologized with the hypophysis of the higher vertebrates. Furthermore, there is also established, apparently secondarily, a communication with the pharynx (foregut). The development is known only through some 12 stages (v. Kupffer, 1900, 1906) of one species (*Bdellostoma Stouti*) and further work is needed to clarify many points.

In the myxinoid just considered, the morphology and morphogenesis are unique; in the second form, the amphibian Hypogeophrys, the cephalic growth is typical, the cavity of the forebrain appears early and a Rathke's pouch is formed (Laubmann, 1926) though its cavity is slight and early disappears. In addition, as already noted, two lateral 'up-growths' become included together with a slight area anterior to the definitive Rathke pouch. Earlier stages are inadequately known. The crossopterygian fishes possibly belong in group I but their development is unknown.

In the remaining classes of the vertebrate phylum, group II, the epithelial constituent of the hypophysis is typically a solid body. Furthermore,—and again typically,—it developes as a solid mass or ectodermal wedge. The contrast in hypophyseal development as between the elasmobranch at the one extreme and the teleost at the other is so great that a fundamentally different morphogenesis might be suspected were it not for the obvious unity in structural pattern which the vertebrates present. There are however certain definite developmental differences which distinguish the two groups and which are of importance for an understanding of hypophyseal development. In the group just considered (group I) the eggs are relatively large and yolk-rick or (in mammals) follow the developmental pattern of a large yolk-rich egg. The central nervous system is formed by the free folding of a neural plate to a tube. In its growth in length the rostral neural plate (and later the vesicular forebrain) freely overgrows the surrounding territory with a marked head-bend. A characteristic hypophyseal plate is thus produced, the transformation of which to a hollow hypophyseal sack has just been reviewed. In group II the eggs are predominantly smaller through relatively yolk-rich; the transformation of the neural plate is massive and cavitation is retarded or late. The neural primordium "hugs" the substrate with the result that the cephalic over-growth is not free or only becomes free relatively late. A head-bend is late or less extreme. The oral cavity (so-called stomodeum) is accordingly late or masked. A further feature of significance is the precocious differentiation in the head ectoderm of a superficial and persistent keratinized layer set off from the deeper blastic or germinative layer. Whether this differentiation is correlated with early hatching and the beginning of a free-living life epoch need not be considered here. In any event, as compared with group I, it is linked with a modification in the mode of origin of certain ectodermal head structures,—lens of eye, otic vesicle, olfactory or nasal sack and the hypophysis, which thus does not originate as a folding of the entire ectoderm.

Necessarily, the hypophysis in its development shares the peculiarities of the general cephalogenesis, the mechanical factors determining its formation being correspondingly altered. In the degree of compactness and the correlated peculiar features of growth, the vertebrates included under group II present a certain gradation according to which they were arranged on page 147 and in this order they will be followed in a brief survey. It may be stated that in many instances additional details of the early hypophyseal development are desired. Although the developmental characteristics of Hypogeophrys places it in group I,—and the hypophysis was there described,—it is somewhat intermediate between the two groups; indeed it is the only form so far as known that may be so considered.

In both of the extant crossopterygians[5] a unique feature is present. In Polypterus (Waldschmidt, 1887; de Beer, 1926) and in the Calamoichthys (Bickford, 1895) a slight cavity is present in an otherwise solid hypophysis. The cavity is in free communication with the mouth cavity by means of a hollow stalk passing through a foramen in the parasphenoid bone. As the developmental stages are unknown it can only be surmised how it was formed. The inference is strong that there is here illustrated a persistent hypophyseal stalk.

In the lamprey (Cyclostomata) the early stages are quite well known (v. Kupffer, 1894; Woerdemann, 1914; de Beer, 1926; Tilney, 1937) but with some differences in interpretation. The early development is characteristic; a solid growth arises immediately rostral to the forebrain. It exhibits however a slight suggestion of a potential pouch formation and a hypophyseal cavity appears later but it is atypical. Furthermore, the adaptative growth of the upper lip underlying the characteristic monorhinia and the cyclostomic condition produces distinctive and unique relations (Cf. Kingsbury and Adelmann, 1924; de Beer, 1923, 1926). The hypophysis retains a connection with the ectoderm by means of a stalk which canalizes, putting the hypophyseal cavity in communication with the single nasal cavity. The lamprey, the myxinoid fish and the two crossopterygians just considered are the only known instances of a persistent communication with the exterior. It is possible, but not probable, that such a condition may be found in certain hybrid breeds of dogs (Stockard and Vicari, 1941).

In the dipnoans the hypophysis arises as a wedge from the ectoderm immediately anterior to the forebrain. In all three dipnoans a well-defined cavity subsequently appears within the solid mass (Dawson, 1940) occupying approximately the position of a residual lumen of a Rathke's pouch. This suggests a virtual cavity become real. Although it appears early (Kerr, 1933) it apparently never opens to the exterior; nor does the hypophysis maintain a persistent connection with the ectoderm.

The hypophysis of ganoids is more or less adequately known through studies of the development in Lepidosteus (Veit, 1924), Amia (Reighard and Mast, 1908; Smith, 1914; De Beer, 1923) and in Acipenser (v. Kupffer, 1893). It arises as a solid wedge immediately anterior to the rostral end of the forebrain

[5] Zoologists are not fully in accord as to the taxonomic position of these peculiar fishes. Some group them with the ganoids.

with which in Amia and Lepidosteus at least it is at first continuous. The connection with the point of origin is lost at or before hatching. A cavity appears quite early and persists.

In the remaining classes of the vertebrates (amphibia, teleosts) there is encountered no cavity formation of the character found in the forms just considered, where it suggests a potential primary cavity become real. Small cavities may appear, it is true (e.g., in teleosts), but they seem to be secondary cysts.

In the Caudata (Urodela) the solid hypophysis underlies the forebrain and is clearly derived from the ectoderm immediately anterior to the neural plate (Kingsley, 1905; Atwell, 1921). Published observations of the development have not included stages sufficiently early to give a record of relations to the anterior edge of the neural plate. However, observations by the writer in *Amblystoma punctatum* (unpublished) revealed an early continuity. In the anura the development of the hypophysis has been followed by several (Corning, 1899; Atwell, 1918; Schliefer, 1935; Kerr, 1939), although as in the tailed amphibia, the earliest development has been somewhat neglected. However, it is clear that it arises as a wedge of the blastic layer of the ectoderm immediately anterior to the neural plate (Corning, Schliefer), while in Bufo (toad) a primary connection with the rostral end of the neural plate is revealed (Schliefer).

In the teleosts, the peculiarities of the development of the head characteristic of the vertebrates of group II reach an extreme. This comment refers particularly to the early solidity of the forebrain and its close application to the substrate during the early stages of the growth of the head,—a period of overgrowth preceding the appearance of cavities in the brain and of the stomodeum. The obscure character of the developmental changes at this time, together with the technical difficulties, makes their determination difficult. This is clearly responsible for the fact that investigations dealing with the development of the teleostean hypophysis, from early classical papers (e.g., Hoffmann, 1884) up to the most recent (Woodman, 1939; Kerr, 1940), begin with stages in which the forebrain has become a vesicle and the typical relation to the hypophysis is already established. A solid cord or stalk may (at that stage) join the hypophysis to the stomodeal epithelium. It is not known whether or not the ectodermal material which becomes the (buccal) hypophysis arises anterior to the (solid) forebrain, as for example is the case in the bony ganoids, Amia and Lepidosteus. With these forms the teleosts might be expected to closely agree. A detailed examination of the early growth of the forebrain in its relation to adjacent ectoderm is needed to complete a comparison and establish a conformity with the other vertebrates of group II.

The apparently different mode of development of the hypophysis in the groups I and II has not escaped comment by those who have considered the matter broadly. There has been frequent recognition of the linkage of the type of hypophyseal development in group II with one or more of the characteristic features of head development earlier listed (Hoffmann, 1884, p. 92; Haller, 1924, p. 305; de Beer, 1926, p. 92; Tilney, 1937, p. 107). The comments are quite pertinent but the concept is customarily that of a gland arising from a definite

"anlage". The background is apt to be taxonomy and phylogeny and the mechanics of the growth is less considered.

As far as "phylogeny" is concerned, it seems clear that the hypophysis is a structure without a phylogeny under the customary use of the term. The "paleostoma" theory, in one form or another, is now of historic interest only and has not been seriously presented since 1923 (Neal); nor does the hypophysis represent a gland which has lost its duct. Morphologically it is mainly an expression of the mechanics of growth as determined by the developmental peculiarities of the prechordal region of the head. The differences in form and structure in groups I and II are largely linked with these. Groups I and II, it may incidentally be noted, do not coincide with taxonomic vertebrate divisions.

Aside from the differences which a varying developmental mechanics imposes, the developmental pattern is the same for all vertebrates, whether the development of the hypophysis takes the form of a Rathke's pouch 'folded off' as an extension of the stomodeal epithelium or a solid wedge appearing earlier with the growth changes less easily followed because of compactness. The two modes of hypophyseal development may now be compared, emphasizing the common features. Considering the hypophysis as an epithelial structure, the fundamental peculiarity is its contact with the floor of the forebrain to which the basal layer of the ectodermal epithelium is rather directly applied. Primarily the contact is at the anterior edge of the neural plate where,—in all forms adequately examined,—a continuity also occurs. Growth rapidly expands the forebrain and when the chiasmatic ridge and the primitive infundibulum become obvious, the hypophyseal epithelial contact is seen to be in this region. It is a customary interpretation that in such vertebrates as the fishes and amphibia the hypophysis "migrates" to the definitive position. This is without proof, and when it is recognized that all evidence indicates that the anterior region of the neural plate is primarily optical in its potencies (Cf. Woerdemann, 1929; Adelmann, 1936, p. 299), it is clear that there is very little shifting, the hypophysis but keeping pace with the growth expansion of the region and itself expanding. Experimental work is here needed.

In all vertebrates the appearance and growth of the mesoderm play a significant role in the morphogenesis. The degree of intrusion between hypophyseal epithelium and neural plate (tube) is characteristically different in different forms and frequently slight. At the caudal end of the contact the relation is, or becomes, most intimate; even a basement membrane, in the absence of intervening mesoderm, may be lacking and neural tube and hypophyseal ectoderm may be confluent, as Atwell (1916) early pointed out for the rabbit embryo. The significance of this intimate association has received scant attention, only Gilbert (1935) giving it serious consideration. It marks the region of the Pars Intermedia,—a term quite inappropriate if all vertebrates are considered, as Tilney (1937) pointed out. Even in this region mesoderm may intervene (e.g., birds and some mammals) and the region as such become non-existent.

Any detailed consideration of the cell types which appear in the development of the hypophysis would be, in the opinion of the writer, premature at the present

time. The gland concept of the hypophysis which views each cell type as a specific secretory source of a definite hormone or hormones cannot resolve the histogenetic aspect of the problem. Although supported by a great amount of work, cytologic and experimental, there are many lower vertebrates in which the cell types are inadequately known. Statements of different investigators are often inconsistent. The work of Scruggs (1939) reveals how variable the cytology (and morphology) may be within a single class (the teleosts). The three cell types so characteristic of the mammalian hypophysis,—acidophiles, basophiles and so-called chromophobes,—have been recognized in all of the classes of lower vertebrates, save perhaps the Cyclostomata. There are, however, pertinent differences. Cells which may be designated as chromophobes are often reported as rare or lacking; and the reason for this is quite apparent. Chromophobes may be described as "faintly basophile". Basophilia characterizes the undifferentiated cells of the early hypophysis and it may thus become difficult or impossible later clearly to distinguish two distinct basophilic cell types. The chromophobe of the mammal is now generally regarded as a "stem cell"; that is, one closest to the embryonic cell type. As a corollary to this it may be suggested that the basophile (at least as far as the basophilia is concerned) is an accentuation of the undifferentiated cell type. The acidophile alone would then express an obvious departure from the primary basophilic condition. The growth of the vasculogenic mesoderm is suggested as an important factor in its differentiation. Where in the mammal the region of intimate contact of hypophyseal ectoderm and neural tube remains, as in the pars intermedia, the basophilia is retained. In birds and certain mammals vascular mesoderm intervenes and the equivalent material develops eosinophiles. In the elasmobranchs and the teleosts the pars "intermedia" is vascular. In the elasmobranch (Norris, 1941) the cells next the vascular channels are eosinophiles,—a relation more than once noted in the mammal. In the teleost this relationship appears less characteristic; the cells bounding small cysts that may appear in development are eosinophiles (Kerr, 1940), while in the pars intermedia (so-called) the cells next the infundibular processes are eosinophiles (Hagen, 1936; Woodman, 1939).

It is obvious that additional detailed work is necessary to determine histogenetic correlations within the hypophysis. Doubtless the histogenesis of the hypophysis underlies the hormonal aspect of its metabolism, but it by no means follows that the cell types are "gland cells", and that the granules which are or may be present in the cytoplasm are specific secretory products. No one has expressed the advisable caution more tersely than Cowdry (1934, p. 195): "The supposition is not warranted that either the acidophile or basophile granules constitute secretion antecedents of hormones. . . . They may be by-products of some sort conditioned by the special chemical and physical changes in the two cell types, not the ripening active principles themselves".

However, it cannot be chance that the hypophysis,—or indeed any one of the so-called endocrine organs,—arises where and how it does. Its hormonal potentialities must have been determined in correlation with the developmental factors of its origin. The hypophysis originates from head ectoderm immediately

anterior to the neural plate. Whether its metabolic characteristics link in with a limitation in the differentiation of the nervous system: or with an alteration of the differentiation peculiar to the surface ectoderm cannot be said. The cell types[6] encountered in the epithelial hypophysis suggest the latter hypothesis. Possibly there has been a progressive advance in the endocrine potentialities of its cell metabolism. Nothing seems to be known regarding the possible hormonal potencies of the hypophysis in either the Cyclostomata or Elasmobranchii,—generally regarded as the most primitive of the living vertebrates. Danforth (1939, p. 336) makes the following petinent statement: "The complex endocrine system of higher vertebrates could hardly have sprung into existence in full functional efficiency. It must rather have had a significant evolutionary history, but one which, unfortunately, has thus far attracted scant attention." Further comments of that author reveal a full appreciation of the fact that the general problem of the endocrine organs and their hormones links in with the problem of metabolic unity.

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LITERATURE CITED

ADELMANN, H. B. 1932 The development of the prechordal plate and mesoderm of *Amblystoma punctatum*. J. Morph. **54:** 1–67.

———. 1936 The problem of Cyclopia. Quart. Rev. Biol. **11:** 162–182; 284–304.

ATWELL, W. J. 1916 On the relation between neural and intermediate portions of the hypophysis. Anat. Rec. **11:** 322–3.

———. 1918 The development of the hypophysis in the Anura, Rana and Bufo. Anat. Rec. **15:** 73–92.

———. 1921 The morphogenesis of the hypophysis in the tailed amphibia. Anat. Rec. **22:** 373–390.

BAUMGARTNER, E. A. 1915 The development of the hypophysis in *Squalus acanthias*. J. Morph. **26:** 391–446.

BEER, G. R. DE. 1923 Some observations of the hypophysis of *Petromyzon* and of *Amia*. Quart. J. Micr. Sci. **67:** 257–292.

———. 1926 The comparative anatomy, histology and development of the pituitary body. London.

BICKFORD, ELIZ. 1895 The hypophysis of the *Calamoichthys calabaricus* (Smith). Anat. Anz. **10:** 465–470.

CHIARUGI, G. 1894 Sull' esistenza di una gemma bilaterale nell' abbozzo della ipofisi dei mammiferi. Monit. Zool. Ital. **5.**

CORNING, H. K. 1899 Ueber einige Entwicklungsvorgänge am Kopfe der Anuren. Morph. Jahrb. **27:** 173–241.

COWDRY, E. V. 1934 A textbook of histology. Functional significance of cells and intercellular substance. Lea & Febiger, Philadelphia.

[6] No reference has here been made to the less frequent cell types often encountered in the hypophysis, such as squamous (keratinized) cells and ciliated cells bordering cavities. Acidophile cells and basophile cells of more than one type may occur. As was earlier stated, the significance of the cytological differences has yet to be analytically considered.

DANFORTH C. H. 1939 Relation of genic and endocrine factors in sex. Ch. VI. Sex and Internal Secretions. Ed. E. Allen. Pp. 328–348.

DAWSON, ALDEN B. 1940 The pituitary gland of the African lungfish, *Protopterus aethiopus*. Biol. Bull. **78:** 275–282.

GAUPP, E. 1893 Ueber die Anlage der Hypophyse der Saurien. Arch. f. mikr. Anat. **42:** 569–580.

GILBERT, M. S. 1934 The development of the hypophysis; factors influencing the formation of the pars neuralis in the cat. Am.J. Anat. **54:** 287–313.

———. 1935 Some factors influencing the early development of the mammalian hypophysis. Anat. Rec. **62:** 335–359.

HAGEN, F. VON. 1936 Die wichtigen Endocrinen des Flussaales. Thyreoidea, Thymus und Hypophyse im Lebenscyclus des Flussaals (*Anguilla vulgaris*): nebst einigen Untersuchungen über das chromophile und chromophobe Kolloid der Thyreoidea Zool. Jahrb. Abt. Anat. u. Ont. **61:** 467–538.

HALLER, GRAF. 1923 Ueber die Bildung der Hypophyse bei Selachiern. Morph. Jahrb. **53:** 95–135.

———. 1924 Ueber die Entwicklung der Hypophyse bei Reptilien. Morph. Jahrb. **53:** 305–318.

———U O. MORI 1925 Ueber die Bildung der Hypophyse der Säugethere. Z. f. Anat. u. Entw. ges. **76:** 159–187.

HOFFMANN, C. K. 1884 Zur Ontogenie der Knochenfische. Arch. f. mikr. Anat. **23:** 45–108.

KERR, T. 1933 On the pituitary in *Lepidosiren* and its development. Proc. Roy. Soc. Edinburgh **53:** 147–150.

———. 1939 On the histology of the developing pituitary in the frog (*Rana temporaria*) and in the Toad (*Bufo bufo*). Proc. Zool. Soc. London. Ser. B. **109:** 67–180.

———. 1940 On the histogenesis of some teleost pituitaries. Proc. Roy. Soc. Edinburgh **60:** 224–244.

KINGSBURY, B. F. 1922 The fund mental plan of the vertebrate brain. Jour. Comp Neur. **34:** 461–491.

———. AND H. B. ADELMANN. 1924 The morphological plan of the head. Quart. J. micr. Sci. **68:** 239–285.

———. AND F. ROEMER. 1940 The development of the hypophysis of the dog. Am. J. Anat. **68:** 449–481.

KINGSLEY, J. S., AND F. W. THYNG. 1905 The hypophysis in *Amblystoma*. Tufts College Studies, Scientific Series. 1, No. 8: 363–378.

KUPFFER, K. VON. 1893 Studien zur vergleichenden Entwicklungsgeschichte des Kopfes der Kranioten. Heft. I. Die Entwicklung des Kopfes von *Acipenser sturio* an median Schnitten untersucht. Munchen u. Leipzig.

———. 1894 Ibid. Heft II. Entwicklungsgeschichte des Kopfes von *Ammocoetes Planeri*. Munchen u. Leipzig.

———. 1900 Ibid. Heft IV. Zur Kopfentwicklung von *Bdellostoma*. Munchen.

———. 1906 Die Morphogenie des Centralnervensystems. Bd. II, Teil 3, Hertwig, O.: Handb. d. vergl. u. exper. Entw. ges. d. Wirbelthiere. Ch. 8, pp. 1–273.

LAUBMANN, W. 1926 Die Entwicklung der Hypophyse bei *Hypogeophrys rostratus* (Beitrag zur Kenntnis der Gymnophionen, Nr. 8). Z. f. Anat. u. Entw. ges. **80:** 1–103.

NEAL, H. V. 1923 Exact homologies in chordates. Anat. Rec. **26:** 375.

NORRIS, H. W. 1941 The plagiostome hypophysis, general morphology and types of structure. Science Press, Lancaster, Penn.

OLDHAM, F. K. 1941 The development of the hypophysis of the Armadillo. Am. J. Anat. **68:** 293–315.

RAHN, H., AND BEN T. PAINTER. 1941 A comparative study of the bird pituitary. Anat. Rec. **79:** 297–306.

REIGHARD, J., AND L. A. MAST. 1908 The hypophysis of *Amia calva*. J. Morph. **19:** 497–510.

SCHLIEFER, W. 1935 Die Entwicklung der Hypophyse bei Larven von *Bufo vulgaris* bis zur Metamorphosis nebst Untersuchungen über den Einfluss hormonaler Substanze auf die äussere Entwicklung der Larven und die Genese der Hypophyse. Zool. Jahrb., Abt. f. Anat. u. Ont. **59:** 383–454.

SCRUGGS, W. M. 1939 The epithelial components of the teleost pituitary gland as identified by a standardized method of selective staining. J. Morph. **65:** 187–213.

SMITH, P. E. 1914 The development of the hypophysis in *Amia clava*. Anat. Rec **8:** 499–506.

STENDELL, W. 1914 Die Hypophysis Cerebri. Lehrb. d. vergl. mikr. Anat. d. Wirbeltiere. Ed. A. Oppel. Part 8.

STOCKARD, C. R., AND E. M. VICARI. 1941 The genetic and endocrinic basis for differences in form and behavior. Section V. Variations in proportional size and modifications in histologic quality of endocrine glands in relation to body types as found among the dog breeds. 399–522. The Wistar Press.

TILNEY, F. 1937 The hypophysis cerebri in *Petromyzon marinus dorsatus* Wilderi. Bull. Neur. Inst. N. Y. **6:** 70–117.

VAN DYKE, H. B. 1939 The physiology and pharmacologyof the pituitary body. vol. II Univ. Chicago Press.

VEIT, OTTO. 1924 Beiträge zur Kenntnis des Kopfes der Wirbeltiere. II. Frühstadien der Entwicklung des Kopfes von *Lepidosteus* und ihre prinzipielle Bedeutung fur die Kephalogenese der Wirbeltiere. Morph. Jahrb. **53:** 319–390.

WALDSCHMIDT, J. 1887 Beitrag zur Anatomie des Centralnervensystems und des Geruchsorgans von *Polypterus bichir*. Anat. Anz. **2:** 308–322.

WEBER, A. 1898 Observations sur les premières phases du développement de l'hypophyse chez les Chéiropteres. (Note préliminaire). Bibliogr. Anat. **6:** 151–158.

WISLOCKI, G. B., AND E. M. GEILING. 1936 The anatomy of the hypophysis in whales. Anat. Rec. **66:** 17–41.

WOERDEMANN, M. W. 1914 Vergleichenden Ontogenie der Hypophyse. Arch. f. mikr. Anat. **86:** 198–291.

———. 1929 Experimentelle Untersuchungen über Lage und Bau der augenbildenden Bezirke in der Medullarplatte beim Axolotl. Arch. f. exper. Entw. ges. **116:** 220–241.

WOODMAN, ALICE S. 1939 The pituitary gland of the Atlantic salmon. J. Morph. **65:** 411–436.

A NEW FUNGUS ON CRAB EGGS

By John N. Couch

Plates 18 and 19

For two successive seasons Dr. C. L. Newcombe, Director of the Virginia Fisheries Laboratory, has sent me eggs of the blue crab (*Callinectes sapidus*) parasitized by fungi. The first season (fall, 1941) the eggs had been kept several weeks in sea water before they were sent and no indications of a parasitic fungus could be detected, except that on some of the disintegrated eggs the empty spherical zoosporangia of an organism resembling *Rhizophidium* were found. Again this past summer Dr. Newcombe and his associates noticed that some of the crab eggs failed to hatch and again, suspecting a parasitic fungus, material was sent to me for examination. This time a considerable number (2–5%) of the eggs were infected by an internal fungus which apparently belongs in the genus *Lagenidium*. Also a considerable number of the newly hatched living crabs had the mycelium in their bodies. With living material at hand it was possible to work out most of the details in the life history of the fungus and the stages as observed in the living but rather stale material were corroborated for the most part by material preserved in formalin immediately after removing the eggs from the crab. This fungus so far as I have been able to ascertain is the first member of the Lagenidiales which has been described from a marine habitat.

Lagenidium callinectes n. sp.

Mycelium developing entirely within the egg and eventually pretty well filling the egg, or body of the young crab, consisting of branched irregular hyphae which are sparingly septate, 5.4–12.6μ thick. Protoplasm with a pale whitish gleam and numerous oil bodies, becoming coarsely granular just before spore formation. In the process of spore formation and discharge the end of a thread becomes applied to the inner egg wall and swells to form a clavate structure up to 30μ thick. The part in contact with the wall forms a narrow tube which grows through the wall and immediately thickens and elongates to form a large tube 11–29 $\times$ 25–70μ. The tip of the tube gelatinizes and protoplasm flows out from the mycelium to collect into a spherical or subspherical undifferentiated mass surrounded by a thick gelatinous envelope. Protoplasmic mass up to 100μ thick. Spores formed as in *Pythium* from this mass of protoplasm, and becoming very active within the gelatinous layer before discharge. When mature breaking through the outer gelatinous membrane or vesicle and swimming sluggishly away. Vesicle persistent. Spores pointed at the front end and rounded behind with a diagonal groove which arises near the front end and extends backward over the rounded end. Cilia arising from this groove and one extending forward, the other backward while swimming. Zoospores about 9.6 $\times$ 12.6μ, with several oil globules one of which is distinctly larger than the others. Encysted spores oblong or subglobose, 10 $\times$ 11.3μ; monoplanetic. Resting bodies formed only after the crab eggs begin to disintegrate, apparently formed asexually in the threads, spherical, subspherical or oval, 18–30μ, thick, usually about 25μ thick, wall up to 3μ thick, containing pale whitish protoplasm and an eccentric mass of oil bodies; germination not observed.

Found growing parasitically on eggs and newly hatched young of Callinectes (common blue crab of eastern seaboard) collected by Mrs. Mildred Sandoz, July 7, 1942, East Lynnhaven, Virginia, and sent to me through the courtesy of Dr. C. L. Newcombe.

Infection is brought about by the zoospores which settle on the eggs (fig. 6). Unlike the spores of the Saprolegniales which round up when they encyst, the spore in this fungus encysts without rounding up. It germinates by sending a delicate tube through the outer egg covering (an extension of the stalk) and the egg membrane. Sometimes the latter is pushed in somewhat before its penetration is effected (fig. 7). Once the tube has entered the living part of the egg it enlarges to the full diameter of the hypha and as the hypha grows the cyst becomes entirely empty (figs. 7, 8). The empty cyst of the spore has a thick and persistent wall and can be recognized for several hours after infection. Several spores may infect one egg and it seems likely that the mycelium from one spore may produce several sporangia.

Because of the thickness of the eggs and their opacity, it has not been possible to follow the development of the fungus in the eggs. It is for these reasons that precise information on the rate of development of the fungus is lacking. However clusters of apparently healthy eggs placed on a slide in a drop of sea water showed several totally destroyed by the fungus after forty-eight hours. Such an egg is shown in figure 19. Even where there is no external sign of the fungus, heavily infected eggs can be distinguished from healthy ones by their smaller size and greater opacity (fig. 1). The healthy eggs were 281–298μ thick, while the diseased ones were about 231μ thick. A microscopic examination with brilliant illumination will show that in such infected eggs the hyphae are abundant, and the contents of the eggs have been pretty well destroyed. The mycelium is branched, sparingly septate and thin-walled. Indeed the walls are so delicate that if the egg is crushed or torn apart at this stage the hyphae are largely destroyed. The protoplasm in the hyphae has a pale whitish gleam with rather conspicuous fat globules.

The early stages in sporangial development have not been followed. Because of the septations in the mycelium it appears that one spore may give rise to a mycelium that forms several zoosporangia. As in other species of *Lagenidium* a zoosporangium may be formed directly from each segment in the mycelium. When a segment is to form a sporangium, the end of a thread grows against the egg wall to form a clavate structure from which a fine hypha is pushed through the egg wall (fig. 10). This hypha grows into a large cylindrical tube (fig. 11). When the protoplasm is ready to emerge the hyaline tip of the exit tube gelatinizes and enlarges to form a spherical mass of clear material into which the granular protoplasm flows (figs. 12–14). It takes 1–3 minutes for discharge to be completed. The mass of protoplasm is usually roughly spherical though sometimes it is quite irregular and never more than half fills the vesicle. From discharge of the protoplasm into the vesicle to dispersal of the spores occupies from 35–50 minutes. The protoplasm contains numerous small vacuoles and many minute fat bodies. Outlines of the spores become evident ten to fifteen minutes after discharge and a few minutes later the cilia can be seen growing out as short stubs (fig. 15). Twenty to twenty-five minutes after the undifferentiated mass of protoplasm has entered the vesicle, the spores have been formed and are swimming around individually in the vesicle (fig. 16).

This rather sluggish swimming may last for ten to thirty minutes before the vesicle bursts and the spores along with numerous granules are discharged (fig. 17). The vesicle is still evident for several hours after the spores have emerged.

The spores swim lazily with one cilium directed forward, the other backward. Dark field observations showed that both cilia are active in propelling the spore as in other biciliate members of the Phycomycetes (Couch, 1941). After swimming for a few minutes the spores settle, some on the crab eggs and others elsewhere. Only the ones on the eggs have been seen to germinate.

Several attempts were made to cultivate the fungus on agar. Zoospores were put on 0.5% plain agar, 2% plain agar, agar #5 (1000cc H_2O, 20 gms. agar, 3 gms. maltose, 1 gm. meat peptone), agar #F13 (500cc H_2O, 10 gms. agar, 0.75 gms. maltose, 0.02 gms. peptone) and corn meal agar but on all of these media the spores disintegrated instead of germinating.

The present fungus appears to be more closely related to *Lagenidium giganteum* than to any other known fungus. The coarse segmented irregular hyphae are very similar in both species. The two can be easily separated by differences in habitat, in the shape of the emergence papillae, as well as by the formation of a distinct vesicle and resting bodies in the present species and their absence in *L. giganteum*. These two species differ markedly from all other species of *Lagenidium* on the basis of size; both are much larger in all respects than other species.

As at present constituted the genus *Lagenidium* contains three rather distinct groups of organisms: (1) the single-celled species, as *L. oedogonii* Scherffel; (2) the rather delicate species with septate hyphae parasitic on algae, as *L. Rabenhorstii* Zopf or *L. Marchalianum* de Wildeman; and (3) the coarse species parasitic on animal substrata, as *L. giganteum*. Unfortunately not all of the species of *Lagenidium* appear to fit into such a scheme, e.g. *L. americanum* Atkinson. Sparrow (1939) in his discussion of a new unicellular species of *Lagenidium* parasitizing rotifer eggs points out the similarity of the unicellular species of this genus to *Lagena* but feels that more studies are needed before the genus *Lagenidium* is revised, a point of view with which the writer is in full accord. In such revisionary studies possible connections between the Lagenidiales and the Peronosporales should be kept in mind.

This appears to be the only member of the Lagenidiales so far described from a marine habitat. However, Atkins (1929) has described a related fungus growing in such a habitat as an internal parasite of the pea-crab (*Pinnotheres*). The *Pinnotheres* fungus apparently belongs in the family Saprolegniaceae, closest to the genus *Saprolegnia* or *Leptolegnia*, and may easily be separated from the present fungus on *Callinectes* by its non-septate mycelium and the *Saprolegnia*-like sporangia.

From this preliminary study it would be impossible to gauge the importance of such a fungus in the commercial raising of crabs. Careful studies should be made on distribution and extent of the disease, conditions that favor infection, host-parasite relationship, and possible means of control. For some of these studies it would be helpful to have the fungus in pure culture on agar or on other-

wise healthy crab eggs. Perhaps the fungus would grow on a nutrient agar made with salt water.

SUMMARY

A new species of fungus growing as a parasite on the eggs of the blue crab (*Callinectes sapidus*) is described as *Lagenidium callinectes*. In the material examined about 2–5% of the eggs and young crabs were infected. Infection takes place by the zoospores of the fungus which germinate on the surface of the crab egg sending in a germ tube which develops into a branched, sparingly septate mycelium. Each segment may become a zoosporangium. The undifferentiated protoplasm is discharged to the outside through a characteristically thick germ tube. The zoospores are differentiated within a distinct vesicle, are sluggish swimmers, monoplanetic, and apparently incapable of germinating except in contact with a crab egg. Spherical resting bodies are formed in old eggs. Attempts to grow the fungus in artificial culture failed.

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LITERATURE

ATKINS, D. On a Fungus allied to the Saprolegniaceae found in Pea-crab, *Pinnotheres*. Journal of the Marine Biol. Assoc. of the United Kingdom **16:** 203–219, figs. 1–13. 1929.

COUCH, J. N. A new saprophytic species of Lagenidium with notes on other species. Mycologia **27:** 376–387, figs. 1–40. 1935.

———. The structure and action of the cilia in some aquatic Phycomycetes. Amer. Jour. Bot. **29:** 704–713, figs. 1–58. 1941.

SPARROW, F. K. A new species of *Lagenidium* parasitic on rotifer eggs. Mycologia **31:** 527–532, figs. 1–15, 1939.

EXPLANATION OF FIGURES

PLATE 18

Fig. 1. Part of a cluster of eggs of *Callinectes*, showing central stalk to which eggs are attached, the two smallest ones parasitized by the fungus *Lagenidium*. × 100.

Fig. 2. One parasitized egg showing exit tubes of sporangium to right and empty cyst of infecting spore above. × 200.

Fig. 3. Cluster of zoospores in vesicle which is indistinctly visible. × 200.

Fig. 4. Parasitized egg showing two clusters of zoospores forming within vesicle; vesicle not visible. × 200.

Fig. 5. Resting bodies in egg, the membrane of which is visible above. × 200.

PLATE 19

(Figures were inked by Else R. Couch)

Fig. 6. Spores encysted on egg membrane. × 585.

Fig. 7. Spore cyst empty, germ tube elongating. × 1000. Fig. 8. Later stage of same.

Fig. 9. Spore settled not in contact with egg membrane, sprouted long tube which formed appressorium against egg membrane. × 585.

Fig. 10. Early stage in formation of exit tube. × 635.

Figs. 11–17. Stages in discharge of protoplasm into vesicle and formation and discharge of spores. ×290.

Fig. 18. Empty exit tube. × 635.

Fig. 19. Crab egg heavily infected with fungus. Note branched rarely septate mycelium; one sporangium at top about to discharge its contents; and four empty exit tubes. Semi-diagrammatic. × 290.

Figs. 20–22. Resting bodies formed after seven days. × 635.

PLATE 18

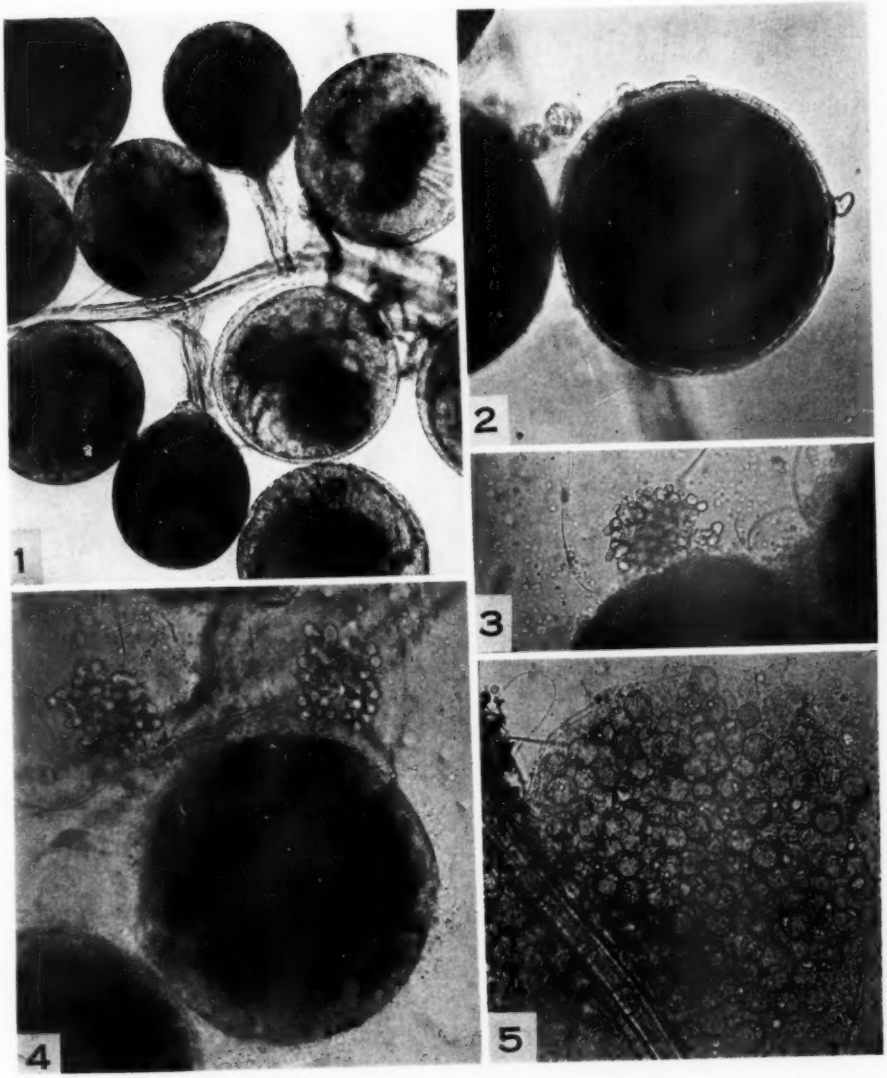
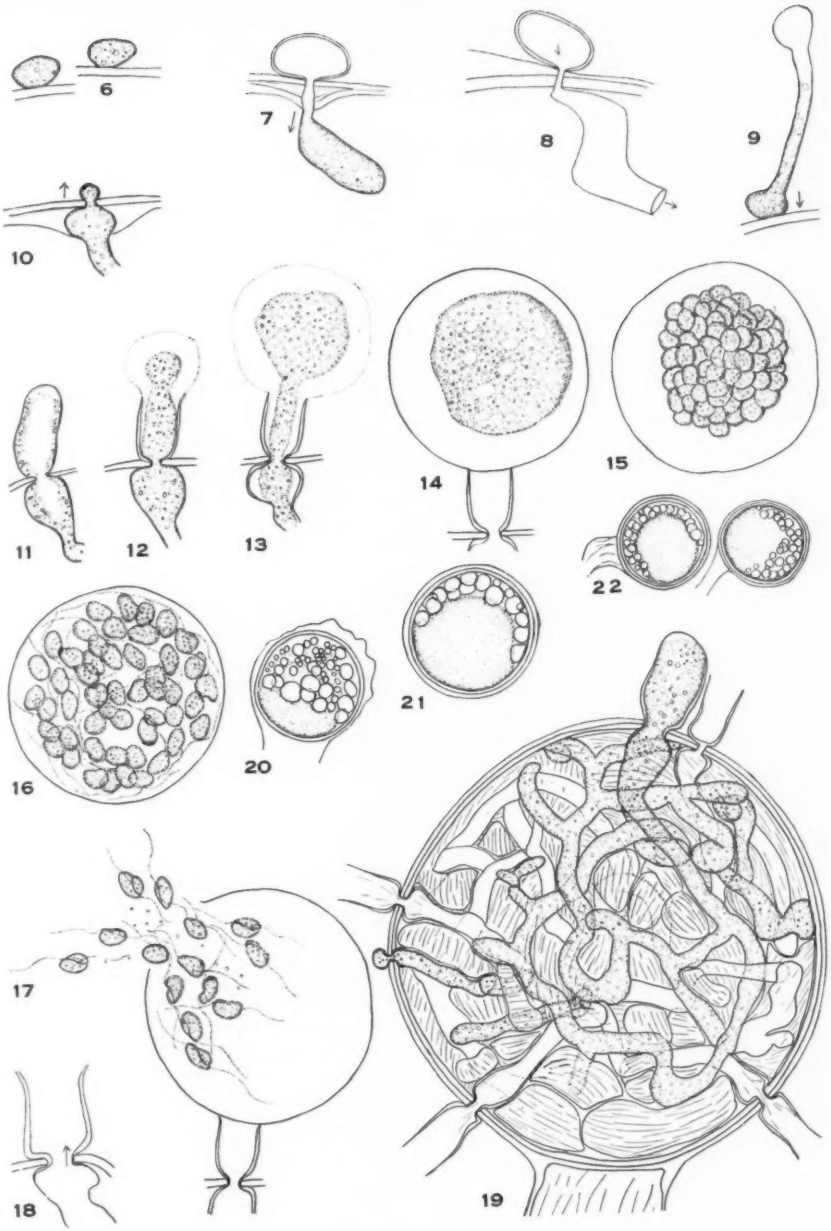


PLATE 19



FURTHER NOTES ON THE REACTIONS OF CERTAIN LOWER ORGANISMS TO THE COMMON SULFONAMIDES

By Edward M. Lavor and Frederick F. Ferguson

The following observations complete our study of the gross physiological reactions of certain free-living aquatic micro-organisms to aqueous solutions of the sulfonamides. We have felt that a better understanding of the reactions of the Protozoa and the lower Metazoa to these drugs might aid in the interpretation of their clinical toxicity. In general the toxicity of these drugs to the free-living forms studied followed very much the pattern which is expressed clinically. The lower forms exhibited a species variation in toxicity which was comparable to that shown in higher organisms. For example, the common laboratory ameba (*Ameba proteus*) displayed a marked resistance to all sulfonamides used. In a previous work Ferguson, Holmes and Lavor (1942, p. 53) reported the reactions of several micro-organisms to sulfanilamide, sulfathiazole, and sulfapyridine and included a few preliminary observations of the effect of sulfaguanidine upon these forms. These results had indicated that in general sulfaguanidine was far less toxic than the other three sulfonamides; that lower percentage solutions were lethal for *Hydra* sooner than the higher ones and that they affected the pigmentation of *Hydra*, readily producing a decolorization. This paper attempts to further the study of the unusual effects of sulfaguanidine upon a general fresh water micro-fauna and includes also a study of sulfathiazole as used upon *Mesostoma ehrenberghii* var. *wardi*, a well organized lower Metazoan (Turbellaria, Rhabdocoelida).

Series 1 of the sulfaguanidine tests consisted of a dilution range from 1.0% to 0.1% using distilled water as the diluent. Saturation was found to occur between 0.16% and 0.14%, thus many dilutions in the upper gradations contained crystals of the drug. Microscopic observations were made of each Stender dish with the contained solution and organism after 1, 2, 5, 12, 24 and 48 hours exposure. The higher (saturated) percentage solutions were not as toxic or lethal as the lower ones for the micro-organisms which in this case included *Hydra*, *Stenostomum*, *Halteria* and *Paramecium*.

Series 2 consisted of a dilution range from 0.50% to 0.05%. This range was used to ascertain the reactions of the organisms to a more dilute series of solutions. Again the lower percentage solutions were more toxic than the others for the microfauna. Within 4 days in series 1 and 2 a uniform toxicity was produced by all dilutions.

Since saturation occurred near 0.16%, this dilution was selected for use as a master solution from which the following twelve percentage solutions were developed: 0.16%, 0.144%, 0.128%, 0.112%, 0.096%, 0.080%, 0.064%, 0.048%, 0.032%, 0.016%, 0.0032%, and 0.0016%. Various series of sulfaguanidine dilutions were made up at these percentages using fresh distilled water, tap water (aeriated) and aquarium water respectively, as diluents. In some cases the tops of the Stender dishes were removed during the test periods.

Series 3, using the dilutions as shown above, showed a relatively high toxicity throughout, undoubtedly due to the use of fresh distilled water as the diluent. Series 4, using a different distilled water, exhibited the same general reactions as observed for series 1 and 2. In series 5 employing aquarium water, the results were also the same as for series 1 and 2. The use of aquarium water as a diluent plus open dishes did not change the results as was indicated by series 6. Other series were used to determine the specific action of sulfaguanidine upon certain Protozoa and *Hydra*. In some of these last series there was developed an unusually high toxicity, while some showed a singularly delayed action of the drug. Summarizing the effects of sulfaguanidine in these last series, it may be said that by 24 hours' exposure very few *Paramecium* had survived, only a few rotifers were alive in the last three percentages, *Halteria* and various heterotrichs were normal, very few Crustacea endured throughout and the hardy ameba were dividing normally in all containers. *Stenostomum* did not seem to be affected by sulfaguanidine, but it was highly susceptible to the toxicity of other sulfonamides as shown in Ferguson, Lavor, and Holmes (1942, p. 54).

In general the action of sulfaguanidine on these micro-organisms was markedly erratic and opposite to that expected as compared with other observations upon sulfonamides. The entire lack of toxicity in certain of the micro-fauna when subjected to solutions of sulfaguanidine was indeed striking. *Hydra* may live for days literally surrounded by drug crystals, yet succumb in time in lower dilutions.

The effects of sulfathiazole solutions upon *Mesostoma ehrenberghii* var. *wardi* were next studied. This flatworm is a well developed, good-sized Turbellarian whose translucent body allows good microscopic observations. Control specimens were kept in distilled and aquarium water. Sexually mature specimens containing numerous eggs in various stages of development were subjected to a finely graded series of dilutions (range from 0.06% to 0.006%) and examinations were made after 15 minutes, 1, 4, 10, 24, 30 and 60 hour periods of exposure. All specimens were normal up to the 48 hour period, but within 60 hours a marked toxicity was apparent in the mid-range dilutions. In these middle lethal solutions the histological disintegration was complete and rapid. The following reactions were noted: the worms did not form new eggs during exposure, no eggs were laid during exposure, the egg cases became shrivelled suggesting an exosmosis, the animal's anterior end became swollen in some instances and in most there was a definite increase in a brownish parenchymal pigmentation. Because of the small number and extreme large size of the chromosomes in this form it would be good material in which to study cytological changes induced by sulfonamide drugs.

SUMMARY

1. Sulfaguanidine solutions were less toxic to fresh water micro-fauna than sulfanilamide, sulfathiazole or sulfapyridine.

2. Sulfaguanidine was not as uniform in its toxic manifestation as were the other sulfonamides studied. High percentages of sulfaguanidine appeared less toxic than lower ones.

3. The length of time required for the sulfaguanidine solutions to produce toxic effects did not appear constant.

4. Aquarium water, when used as a diluent, produced the same results as with distilled water, except that the effects were markedly deferred.

5. Sulfaguanidine solutions, when applied to *Hydra* were either non-toxic or only slightly so in higher percentage solutions; whereas they were weakly toxic in lower percentage solutions producing a uniform decolorization of tissues which did not appear to harm the animal.

6. *Mesostoma* when exposed to aqueous solutions of sulfathiazole exhibited the expected toxic reactions plus an unusual increase in parenchymal pigmentation.

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LITERATURE

FERGUSON, FREDERICK F., JANE R. HOLMES, AND EDWARD LAVOR. The effect of some sulfonamide drugs upon several free-living micro-organisms. Journ. Elisha Mitchell Sci. Soc. **58**: 53–59. 1942.

MARSHAL, E. W., ET AL., Sulfanilylguanidine: a chemotherapeutic agent for intestinal infections. Bull. Johns Hopkins Hosp. **67**: 163–188. 1940.

A STUDY OF THE GROSS PHYSIOLOGICAL REACTIONS OF LOWER ORGANISMS TO THE ANTI-SULFONAMIDE, PARA-AMINO-BENZOIC ACID

By Edward M. Lavor and Frederick F. Ferguson

The nature of the action of para-amino-benzoic acid (PAB) has been the subject of much investigation since PAB was reported to nullify the inhibitory effect of sulfonamides on bacteria in suspension (9). The closely related sodium para-nitrobenzoate when used upon *Streptococcus* cultures produces an inhibitory substance (7). PAB along with sulfanilamide and urethane possesses narcotic properties (3), seems to be an essential metabolite for autotrophic organisms (8), inactivates the fungistatic action of sulfanilamide (1), when combined with sulfaguanidine induces extensive thyroidal changes in the rat (6) and when used, among other subsances, upon *Cypridina* the luminescence is reduced (4).

In previous papers (2, 5), we have reported observations on the gross physiological reactions resulting in certain free-living aquatic micro-organisms when exposed to aqueous solutions of the sulfonamides. Since sulfanilamide (SA) responds readily to the inhibitory properties of PAB in clinical practice, this study was outlined to determine if PAB would inhibit these toxic manifestations of SA in the same organisms.

Many series of percentage solutions of SA and PAB were prepared, using freshly distilled water as the diluent. All of the test organisms were exposed to samples of the various dilutions of these drugs in small, clean, covered Stender dishes. Observations were made at slightly below room temperature. Living material included freshly collected freshwater ciliates, nematodes, and rotifers and laboratory cultured *Ameba proteus* and *Paramecium caudatum*. Microscopic observations were made with B. and L. wide field binoculars. Adequate controls were studied with each series of dilutions.

Series 1 contained 1 cc. each of SA and PAB of a dilution range of from 0.8% to 0.1%. This range was extremely toxic to all organisms with the exception of amebae within 15 minutes. Controls consisted of three dishes each of PAB and SA in the same dilution range. Here PAB proved to be generally more toxic than SA within this period. PAB of 0.1% is definitely far more toxic than SA of 0.8%. These results gave rise to the following questions: first, would PAB at a non-toxic or lethal concentration inactivate SA of 0.8%; second, would the non-lethal PAB concentration inactivate SA of a slightly toxic concentration; third, what is the lethal range of PAB on these forms?

Series 2 consisted of PAB (dilution range 0.1% to 0.01%) without SA. Within 15 minutes all organisms in the 0.09%, 0.08%, and 0.07% were dead; in the 0.06% only the hardy nematodes were still motile and in the other dilutions (0.05%, 0.04%, 0.03%, 0.02% and 0.01%) only amebae were assumed to be alive. Animals in the control dishes seemed unharmed, thus PAB in concentrations of 0.02% was definitely toxic, while in concentrations above 0.05% it was lethal.

Series 3 also consisted of PAB used alone but in a more diluted range (0.009% to 0.001%). Controls in this case were three dishes each of PAB (0.01%) and of distilled water. When observed after 15 minutes of exposure, the organisms in all dilutions seemed to be normal. In the controls the forms in distilled water were unharmed, while those in PAB (0.01%) were all dead except amebae. In our previous work on sulfonamides the amebae also displayed an exceptional resistance to the drugs. After 30 minutes the 0.009% dilution contained normal amebae but very few living ciliates and rotifers; the 0.008% had normal amebae, more living ciliates than above plus several rotifers and nematodes; the next two dilutions (0.007% and 0.006%) contained relatively few ciliates but unharmed amebae, while the remaining dilutions did not during this time lapse seem to be toxic. This series which seemed to be a suitable one was studied at the end of 1, 6, 24, 48 hours and then once daily for a week. It appears from our observations that the line between toxicity and non-toxicity lies between 0.009% and 0.008%. At the end of the study period the PAB control (0.01%) contained only normal amebae, while the distilled water contained normally dividing organisms. In the series only the 0.009% still showed its toxic effects on the ciliates in particular, the other organisms being normal. In all other dishes the amebae were increasing along with the remaining microfauna. It seemed desirable at this point: first, to select one easily grown form which exhibited a medium resistance to both PAB and SA; second, to expose this form (*Paramecium caudatum*) to a carefully graded series of SA dilutions, to ascertain its reaction not only to one such series but to several; and, finally, having found the near toxic dilution of PAB (0.008%) to combine this with a near lethal dilution of SA.

Accordingly, series 4 was set up to consist of SA used alone on *Paramecium* with a dilution range of from 0.8% to 0.08%. Within 15 minutes this proved lethal for about 50% of the specimens in the 0.8%, the survivors in that dilution displaying slowness of movement and marked edema. Very few animals were dead in the 0.7% and 0.6% dishes, while in the other dilutions the majority were normal. After 1 hour of exposure the survivors in the upper part of the series resumed normal movement while the picture remained unchanged for lower dilutions. Thus, many immobilized organisms recover to the degree that they may be tactually stimulated to movement, however the abnormally swollen forms never regain normal activity.

Series 5 involved dilutions of SA which ranged from 0.072% to 0.008%. After 15 minutes of exposure the 0.072% dish contained *Paramecium* of which a few were swollen, some few exhibited pellicle papillae especially posteriorly while nearly all seemed partially paralyzed but moved if stimulated. This condition existed throughout the graded series down to the 0.032%, which dish had normal organisms excepting a few which still displayed tendencies toward immobility. In the next to last dilution few were slow and swollen, all others seemed normal. The last dilution (0.008%) contained apparently normal individuals. Within an hour's time there was a marked improvement for specimens in all dishes with only a slight abnormal edema showing in a few in the 0.072% dilution. Thus, in this series those individuals of *Paramecium* surviving the first few minutes have

a good chance of recovery from generalized cell edema, a sort of paralysis, vesicular swellings, or small surface papillae. Survivors gradually assume normality. It appears that in a medium range series the toxic effects of SA upon *Paramecium* may definitely be worn off in time.

Series 4 and 5 of SA were next combined as one (dilution range from 0.08% to 0.008%), adding 0.2 cc. of PAB (0.008%). This presumably should tell whether or not the extreme toxic effects in the upper range dilutions could be counteracted; on the other hand, the PAB plus the SA might show a toxicity in the lower range dilutions. Results after 15 minutes indicated that specimens of *Paramecium* in dishes from 0.8% to 0.056% were apparently unaffected by this combination, in the sense that PAB acts as an anti-sulfonamide, but the lower dilutions produced a marked slowness of movement and general debility. A repeat on the above extended dilution range showed again that the line between toxicity and lethal effects existed approximately at 0.056%. Our results did not show the expected inactivation of SA by PAB. Controls, consisting of PAB (0.008%) and of distilled water and combinations of equal volumes of these, showed that the combination was more toxic than either separately. PAB solutions in the range from 0.09% to 0.01% were either highly toxic or lethal. During a week's exposure to the combination of SA and PAB all organisms in all dilutions finally developed marked malformities with the cessation of divisions.

Since PAB does not nullify the action of SA under our described conditions it appeared that the next most significant thing to study was the nature of the toxic effects of PAB used alone upon *Paramecium* in a carefully graded series and to ascertain those concentrations of the acid which inhibit normal cell divisions. Our method was to place a definite number of regularly dividing specimens under exposure and to observe carefully the mortality and physiological effects including growth. Accordingly, series 6 consisted of 27 dilutions ranging from 0.1% to 0.001% of 2 cc. of PAB plus 0.2 cc. of *Paramecium* in culture water. In no case did the number of animals exceed 15. This extended series was repeated three times. Controls used were 9 dishes of distilled water plus a definite number of ciliates. These series were checked at 15 minutes, 30 minutes, 1 hour and then once daily for a week Results: during the first few minutes the line between toxic and lethal effects was at 0.008%, this level lowering to 0.003% at the end of an hour; in higher dilutions death comes suddenly leaving the cell in a well fixed condition; in the middle range the most noticeable physiological effect was slowness of movement; in several of the lower range dilutions many forms showed a peculiar edematous condition of the posterior cell producing there a small crooked tail. The distilled water of the controls seemed to be more toxic than usual, which might account for the somewhat increased levels of toxicity in the entire series. There was no increase in organism numbers except in a few dishes of the lower range. Within two weeks' time there developed in all dishes above 0.004% a delicate white fungus,* the appearance of which coincided with the disappearance of all microfauna.

* A description of this fungus is available for anyone interested.

SUMMARY

1. Para-amino-benzoic acid and sulfanilamide used alone and in combination in strong solutions (0.8% to 0.1%) are extremely toxic to free-living aquatic microfauna. PAB of 0.1% is definitely far more toxic than SA of 0.8%.

2. A dilution range of 0.1% to 0.01% of PAB is either toxic or lethal for most organisms studied.

3. Amebae are as highly resistant to the toxic effects of PAB as to the common sulfonamides.

4. A dilution range of 0.009% to 0.001% of PAB produces suitable gradations in physiological reactions including death, toxicity, and non-toxic effects. The line between toxicity and non-toxicity is on the average between 0.009% and 0.008% for most organisms.

5. *Paramecium caudatum* exhibits a medium resistance to both PAB and SA solutions.

6. *Paramecium* displays pellicle papillae, partial debility and decreased speed when exposed to a low dilution range of SA (0.072% to 0.008%). Those that survive the first few minutes in such dilutions eventually appear to recover. Organisms also recover from the toxic effects of PAB solutions.

7. Long exposure to a combination of PAB and SA produces cytological malformities and cessation of divisions in *Paramecium*.

8. In higher concentrations of PAB containing only *Paramecium* death comes suddenly as in fixation, while in low concentrations only a very few dilutions showed an increase in numbers of organisms. A fungus growth is in time supported by the higher concentrations.

9. Our study does not show convincingly that PAB under these conditions acts as an anti-sulfonamide, while its value as a growth factor is doubtful.

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LITERATURE

1. DIMOND, S. Science **94:** 420. 1941.
2. FERGUSON, F. F., HOLMES, J. R., AND LAVOR, E. M. Journ. Elisha Mitch. Sci. Soc. **58:** 53–59. 1942.
3. JOHNSON, F. H. Science **95:** 104. 1942.
4. JOHNSON, F. H., ET AL. Science **95:** 203. 1942.
5. LAVOR, E. M., AND FERGUSON, F. F. Journ. Elisha Mitch. Sci. Soc. **58:** 163. 1942.
6. MACKENZIE, J. B., MACKENZIE, C. G., AND MCCOLLUM, E. Science **94:** 518. 1941.
7. MILLER, J. K. Journ. Pharmacol. and Exp. Therap. **72:** 354. 1941.
8. WIEDLING, S. Science **94:** 389. 1941.
9. WOODS, D. D. Brit. Journ. Exp. Path. **21:** 74–90. 1940.

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